FRIDAY, MARCH 30, 1883.

SCIENCE AND THE NEWSPAPERS.

WE hear a great deal about the educating influence of the press, and it cannot be denied that this influence is very great. Every one reads the newspapers, and is more or less affected by them. To say that the press exerts a great educational influence is, however, not necessarily praise; for this influence may be bad, and in some respects it undoubtedly is bad. Leaving out of consideration the obvious illustrations of this truth, it seems to be desirable to call special attention to one direction in which the newspapers, as a rule, signally fail in their attempts to educate the public; and that is, in reporting the transactions of the meetings of scientific associations. Fortunately the attempts are not often made; but, when they are, the results are quite different from what the editors probably desire. The intention of the editors is, we take it, really to inform the public, in an honest, straightforward way, what the papers presented at the meetings are about. Perhaps the gentlemen think that this is actually accomplished: nothing can be farther from the truth. Usually, instead of a clear statement, a column or two of the veriest nonsense is strung together by a young reporter entirely ignorant of the first principles of the simplest science. The matter passes into the office, and is accepted by an editor as ignorant of science as the reporter; and the result is, that science is belittled, and the public deceived — certainly not educated. When ignorance alone is exhibited in these reports, they may be regarded with equanimity by those who are informed; for the ignorance of the writer appears on the surface, and no one can or does hold the author of the paper responsible. But when, added to the ignorance, there is a tendency to ridicule, to turn matters of grave importance into petty jokes, — in general, to betray a flippant spirit in the treatment of the subjects discussed, — then it is time for science to enter a protest, not in the interests of scientific men (for newspaper reports, no matter how bad, do them little harm), but in the interests of science itself.

When a newspaper in a semi-civilized region makes sport of death; when an execution is emphasized by mirth-provoking head-lines; when the most sacred things are ridiculed, — the refined members of the community are shocked. So, too, when the earnest efforts of investigators are used by strangely incompetent young men for the purpose of exhibiting their sophomoric humor, those whose senses in matters of science are in the least refined feel outraged. They feel that the newspapers which lend themselves to such abuses are guilty of a sacrilege for which they should be held responsible. The harm done is both positive and negative, — it is positive in so far as entirely false notions in regard to the work of scientific men are given currency, and ignorance is encouraged; it is negative in so far as the opportunity for really correctly informing the public is lost.

All who hold science in reverence; who believe, that, through scientific investigation in every direction open to us, the truth will at last be reached; who believe that the spread of correct ideas concerning natural phenomena will eventually dispel that superstition which is now the great enemy of progress, — all such cannot but deplore any thing which in a tangible way is opposed to the development of scientific culture. We call upon the editors of our great daily newspapers to carefully consider the subject, and to endeavor to remedy what must be regarded as a grave difficulty. Better no reports at all than such as are usually furnished; but the work of reporting might easily be well done, and, if well done, would be of value.

THE PRESENT STATE OF SCIENCE IN BRAZIL.

THE last ten or fifteen years have witnessed a marked awakening in Brazil to the importance of scientific research, and the inauguration of what may fairly be termed a new movement, of which, so far as the writer is aware, no account has yet been given to the outside world; while Brazilians themselves are

perhaps, for the most part, unaware of the importance and promise of the scientific activity developed in their midst by a small group of earnest workers. Although Brazil has, ever since the abandonment of the narrow, restrictive, colonial policy of Portugal which proscribed foreigners, been the chosen field of research of many eminent foreign naturalists, the Brazilians have, with a few honorable exceptions, been content to receive at second hand their knowledge of the natural history of their own country, and have seldom undertaken, on their own account, to supplement and correct the work of foreign naturalists, much of which is necessarily incomplete and erroneous. Nor has the government, until recently, granted well-directed and sustained aid in favor of scientific investigations; although it has for many years maintained, at considerable expense, scientific departments in all the higher institutions of learning, and in establishments like the national observatory and museum, and has, in a few instances, organized surveys and exploring expeditions. Through bad organization or insufficient support, the scientific results of all these efforts have, however, been of small value. While this unsatisfactory state of affairs, so natural in a new country, has been the rule, it should not be overlooked that the government has, for a number of years, given an annual subsidy of about five thousand dollars towards the completion and publication of von Martius' great Flora braziliensis; and several foreign naturalists have, like Agassiz, received important official and private encouragement and aid in the prosecution of their researches.

Towards the close of the colonial period a promising scientific movement was begun, which received a severe check from the political troubles attending and following the emancipation of the country from Portuguese rule, — a check from which science in the empire is only just beginning to recover. At that time the national museum was established, having as a nucleus the splendid mineralogical collection of Werner, that, after a strange succession of mishaps, came to a final resting-place in Rio de Janeiro. An able mineralogist and geologist, Baron von Eschwege, was made inspector of mines, and, for about a dozen years, investigated, with admirable proficiency, the geology and mineralogy of the gold and diamond regions; while Pohl and Sellew carried on investigations in other parts, in part at least under government auspices. Two Brazilian mineralogists, Andrada and Camara, were drawn into politics; and in the former an able scientific man was transformed into the patriarch of Brazilian independence. At or about the same time, Friar Velloso prepared an important work on Brazilian botany, of which, unfortunately, only the plates were, until recently, published. The later work of Freire Allemão in the same field, being produced at a time of almost complete indifference to science, have for the most part been lost, or remain unpublished, as has also happened to that of Alves Serrão, Burlemaqui, and Capanema, in geology and mineralogy, and of the poet Gonçalves Dias in ethnology.

For a long period what passed for science in Brazil was characterized by an almost complete absence of investigation; and although there are many names with a local, or even national, reputation as teachers or writers on scientific subjects, it is difficult to find any solid contributions in the field of either the natural or physical sciences. Even to-day there are many reputations that have no real basis in original work of merit. The appearance, therefore, of a group, however small, of real investigators, marks the beginning of a new era; and, although this beginning is as yet a very modest one, its effect is already being felt, and will increase from year to year. This awakening to a knowledge of what science really is, and of the true methods of pursuing it, may be ascribed to various causes. The increased facilities of communications, and the constantly widening relations with foreign countries, the new life and energy developed by a great struggle like the Paraguayan war, the visit of Professor Agassiz in 1864, and the visits of the emperor to Europe and the United States, — have probably been the most important determining causes. Of these, the last is by no means the least. With a strongly developed scientific taste, and with such knowledge as could be obtained with the means at his command and in the non-scientific environment in which he was placed, the emperor profited to the utmost, in his travels, to associate with scientific men, to visit museums and schools, and to acquaint himself thoroughly with the means and methods of research; so that he returned with clearer conceptions of what was best to encourage and promote in his own country. Within the last ten or fifteen years the higher schools and scientific establishments have been reformed and given a better organization, new departments, and increased appropriations, which, although still very small for their needs, are princely in comparison with what they formerly received; an efficient mining-school has been established;

professors and specialists have been imported from abroad, though not to the extent that would have been expedient for some of the new departments and for work new in the country; a geological survey was organized, though, being somewhat in advance of its time, it was, from a spirit of short-sighted economy, suspended after two years of efficient work; the practice of attaching naturalists to engineering explorations has been adopted; and in many other ways scientific research is being promoted.

At present the national museum and observatory in Rio, and the school of mines at Ouro Preto, are the principal centres of scientific activity. The latter, being a comparatively new establishment, remote from the centralizing tendencies of the capital, organized on European models, and controlled by an able corps of French specialists, has escaped many of the vices of organization of the older institutions. The two former, although badly handicapped by lack of means and defective organization, have outstripped the other institutions that ought naturally to be important scientific centres, because in them the reform was more radical and complete, and, the working-corps being small and for the most part new, the chances of filling the places with competent specialists have been far greater than in the medical schools of Rio and Bahia, the polytechnic school and the Dom Pedro Segundo college at Rio. In these a greater number of the defects of the old organization are still retained, and some of the new features are of doubtful utility, while the whole organization is still too cumbersome and centralized for efficient special work in any department. The system of filling the professorships by competitive examination, as it has been conducted, too often gives the showy qualities of rhetoric and smartness the preference over solid merit as proved by original research; and the most competent often refuse to enter, or, if they do enter, are beaten in a competition in which a majority of the examining board has only very superficial knowledge of the subject of the chair to be filled.

The national observatory, now under the direction of Dr. L. Cruls, has of late years been completing its equipment, and has recently commenced the publication in French of a series of annals. Aside from its regular work, it organized four parties for the observation of the passage of Venus, two of which were outside of the limits of the empire. Astronomical work is also being carried on in a small private observatory by Dr. Pereira Reis, the former vice-director of the national observatory, and by some of his colleagues of the polytechnic school. The organization and equipment of this observatory by private individuals, assisted by voluntary contributions, is one of the most hopeful signs of the new scientific movement.

The national museum commenced in 1876 the publication of its Archivos, of which six volumes have already appeared, containing papers prepared in connection with the museum or with the extinct geological commission, the material of which is now incorporated with the museum. Among these papers, those of the late Professor Hartt on the archeology and ethnology of the Amazonas, of Drs. Lacerda and Peixoto on Indian crania, of Dr. Ladislau Netto and Ferreira Penna on Brazilian archeology, of Professor Derby on geology, of Dr. Lacerda on the physiological action of snake-poisons, and of Fritz Müller on insects and crustaceans, are worthy of special mention. A splendid monograph on the cretaceous invertebrate fossils, numbering over two hundred species, mostly new, collected by the geological commission, is now being prepared for the Archivos by Dr. C. A. White of the National museum of Washington, and will probably be followed by monographs on the equally rich carboniferous and Devonian faunas by Messrs. Derby and Rathbun, former members of the geological commission. The museum is at present devoting special attention to anthropological researches; to which the director, Dr. Ladislau Netto, is giving a large portion of his time, and lately held a very creditable exposition in this branch, by means of which considerable public interest was aroused, and large additions to the collections secured. The botanical work of the museum is under the direction of Dr. Nicolau Moreira, assisted by Mr. Schwache, an able German botanist. In the geological department Messrs. Derby and Freitas are chiefly occupied in the study, and preparation for publication, of the rich material accumulated by the geological commission, and, as far as circumstances will permit, in the prosecution of the geological study of the empire. The geological reconnoissance of the great São Francisco valley, and of the auriferous and diamantiferous belt of central Minas Geraes, by Professor Derby, is the most important of recent work done in this department. Under the direction of Dr. Couty of the polytechnic school, and Dr. Lacerda of the museum, a laboratory of experimental physiology was established some three years ago, annexed to the museum. In this, carefully conducted in-

vestigations on various subjects have been carried on, the results of which have been in part published in the French scientific journals. Of the work published in Portuguese, that of Dr. Lacerda, on the nature and physiological effects of snake and other poisons, and the successful application of permanganate of potash as an antidote to snake-poisons, is the most striking and important. The laboratory being open to investigators outside of the establishment, several have availed themselves of the opportunities thus afforded; and Messrs. Guimerães and Raposo have investigated the physiological effects of coffee, Paraguayan tea, and other alimentary substances; and Dr. Araujo Goes is now engaged in studying the microscopic organisms of pulmonary diseases.

The school of mines also has its annals, of which one volume has been published, containing important papers from the pen of the director, Professor Gorceix, on the mode of occurrence of the topaz, diamond, and other precious stones, and on the geology of the regions where they occur, as well as papers from the students of the school, which prove that it is training an able corps of investigators, from which much may be expected in the future. The second volume, now in preparation, will contain translations of the little-known papers of Lund on the bone-caverns of Lagoa Santa.

The past year has witnessed an almost complete reorganization of the medical school of Rio de Janeiro, with the establishment, on a liberal scale, of many new laboratories for instruction and research, from which much good work is naturally to be expected. Up to the present time the studies of Dr. Domingos Freire in organic chemistry, and on the microscopic organisms of yellow-fever, and the nature, cause, and treatment of that disease, are the most important that have appeared from that institution.

In the polytechnic school the era of investigation has been too recently introduced, and on too small a scale, to have yet produced any material results. Dr. Saldanha da Gama, in the botanical department, is studying the flora of the vicinity of Rio, and training his students in the methods of research; and important geological and mineralogical investigations are being carried on by Dr. Ennes da Souza, who has had the advantage of a thorough scientific training at Freiberg. The chemical department has just received as guests Professor Michler of the university of Zurich, now on a scientific visit to Brazil, and Dr. Sampaõ, a Brazilian graduate of the same university, who are conducting elaborate investigations on the chemistry of Brazilian vegetable products.

Brazil not having as yet reached that stage of scientific and material development in which scientific men can hope to gain a livelihood, and find means and time for investigation outside of the government schools and other establishments, little can be expected among private workers. Notwithstanding this fact, the development of what may be called the official science has been too slight to place it in advance of the non-official. Fritz Müller, a farmer in a German colony of southern Brazil, finds time for the zoölogical investigations that have given him a world-wide reputation; Glaziou, director of the public gardens of Rio, has contributed largely to the Flora braziliensis, and is probably unsurpassed in his knowledge of Brazilian botany; Rodrigues Peixoto, a practising physician, has been associated with Lacerda in important studies on Brazilian craniology; and Barbosa Rodrigues has worked extensively on the palms and orchids in botany, and in the fertile field of Amazonian ethnology.

Though the showing for Brazilian science is so small, and some of the work above mentioned may, on close scrutiny, prove to be somewhat crude and non-scientific in its methods and deductions, enough has been done to mark the dawning of a new era full of promise for the future, and characterized by the study of nature rather than the study of books. The small nucleus of investigators cannot fail to train disciples, to draw others around them, and to educate the government and people to the point of distinguishing true research from mere empty show and glitter. When once truly scientific methods come to be fairly naturalized in the country, the Brazilians will not be found lacking in the mental qualities that make able and original investigators. If scientific progress be slow, it will not be, as hitherto, from indifference, or ignorance of the true nature of science, but because the material development of the empire does not permit the facilities of research enjoyed in older and richer countries.

HISTORY OF THE APPLICATION OF THE ELECTRIC LIGHT TO LIGHTING THE COASTS OF FRANCE.[1]

IV.

In the English lighthouses, for which the de Meritens machine has also been adopted, another style of commutator is used, as shown

[1] Continued from No. 7.

in Fig. 13. In this arrangement, the terminals to which the conductors from the lamp and those from the two machines are connected have

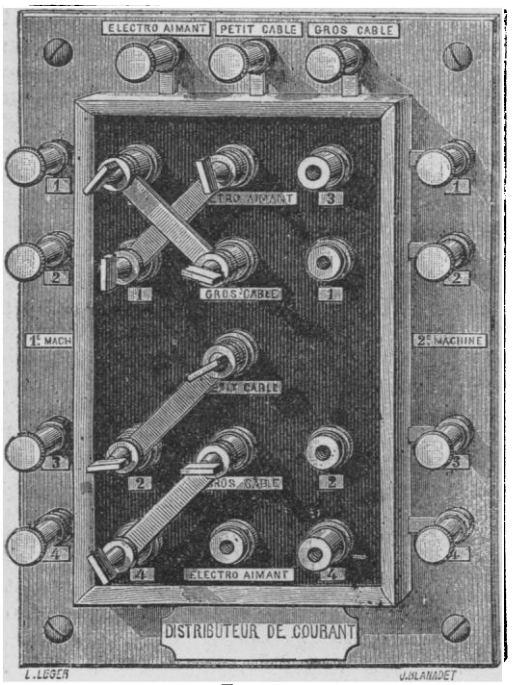


FIG. 13.

practically the same relative positions as in the previous case. From these terminals pass stout copper strips, which can be clamped by binding-screws bearing the same numbers as the terminals. The locking-pieces in connection with the terminals of the machine can be connected by thick copper strips by the binding-screws corresponding to the lamp-cables; and to facilitate this coupling, the locking-pieces are more or less raised, so that the strips may cross each other without touching. In this way perfect contacts are obtained; but a longer time is required to change the combinations. Fig. 13 shows the connections when machine No. 2 is coupled for quantity. Fig. 14 allows the difference in height of the locking-pieces to be seen, and shows how machine No. 1 is coupled for quantity.

The metallic rails upon which the regulator rests have already been described. These rails are in direct communication with the large cable; and it is by them that the current arrives at the frame of the regulator, and thence to the carbons. The cable of the electro-magnet and the small cable are attached to two terminals (H and H′, Fig. 15) with insulated springs. These springs, pressing on two contacts under the lamp, make the appropriate connections.

The regulator itself is a combination of the Serrin and Berjot lamps. It comprises the two electro-magnets of the latter lamp, the armatures of which form an internal core, — one magnet having coarse wire, and placed direct in the circuit; the other having fine wire, and mounted in a derived current. The former acts on the articulated frame carrying the lower carbon; the latter acts on the disk brake controlling the clock-work.

Fig. 15 shows at S the electro-magnet with coarse wire acting by the arm Q on the frame. R and R′ are the springs which tend to raise this frame. L is the lever which serves to regulate the tension of the spring R: it is controlled by a screw, V, which can be turned by inserting a key at the hole O. The magnet with fine wire is placed symmetrically with the other on the opposite side of the clock-work.

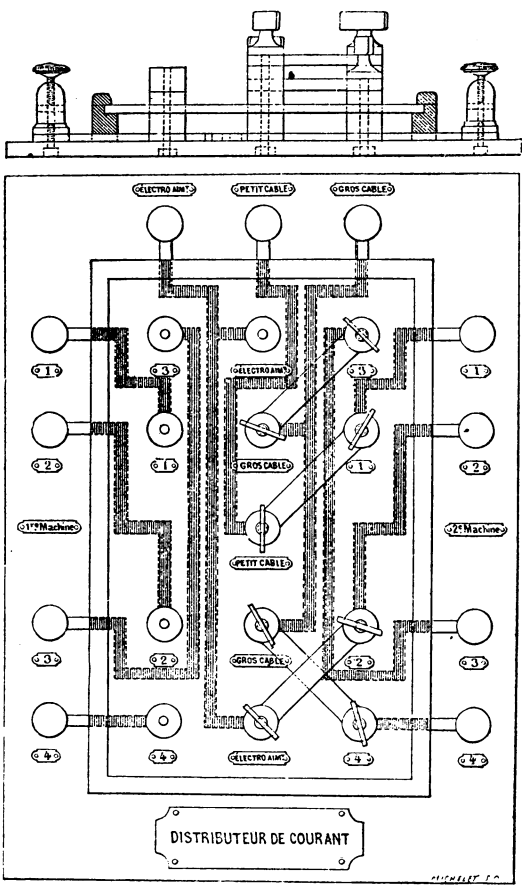


FIG. 14.

The connection of the two carbons to the prime mover of the clock is made by means of a steel ribbon, F, attached to the lower ends of the two rods *g* and *l*. This ribbon is led over several pulleys, and is wound on a wheel on the axis of the prime mover for a great part of its circumference. The turning of this

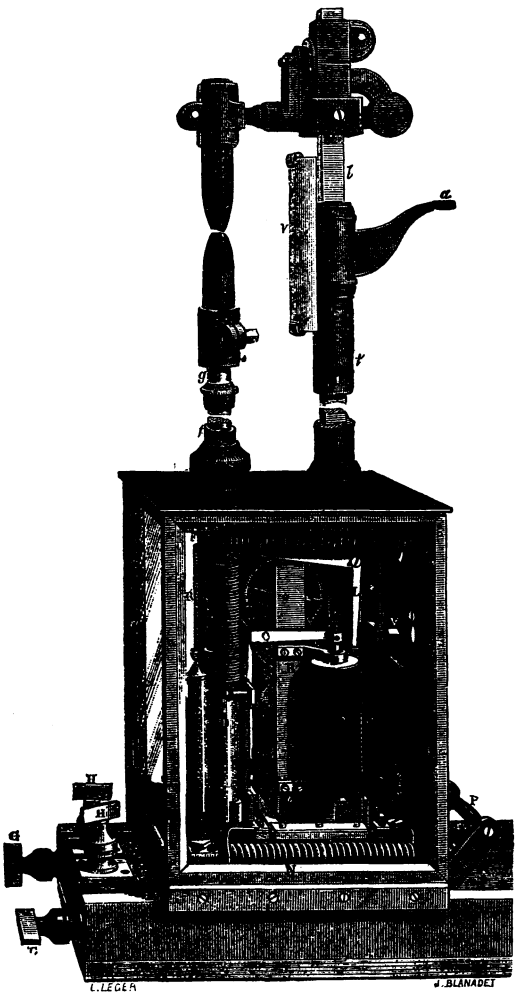


Fig. 15.

wheel is thus produced in a very certain manner. The rod *g* slides in the tube D fastened to the movable frame, and this tube is slit vertically to allow the attachment of the ribbon to pass. This manner of connecting the two carbons, which replaces the chain used by Serrin, and does away with the use of ratchet-wheels, allows the carbons to be placed at any desired height by a slight sliding of the ribbon.

Another peculiarity of this lamp is the mode of connecting the different interior parts of the apparatus. The current of the large cable arrives at the upper carbons by the rails and uninsulated portions of the regulator. From the lower carbon, it returns to the two insulated terminals H and H′, passing to one by the movable frame, and to the other through the electro-magnet S. The connections between the contacts are made with four thick spirals of nickel-plated copper. Two are shown at M and N.

The tube D, which carries the rod *g*, is not insulated from the frame; but the latter is insulated from the upright which supports it. This is on account of ease of construction, it being less difficult to insulate a straight piece than a round tube like D. An air-pump, T, serves to check the motions of the frame, and to prevent too rapid oscillations. The porous plate V is placed opposite the ends of the carbons, to protect the rods *t* and *l* from the excessive heat of the *foyer*. It is composed of the same material as the porous vases used in batteries. When the upper carbon rod arrives at the end of its course, it acts on a bevelled piece, which frees a contact spring, and suppresses the communication with the fine wire magnet, so that it may not be injured by the passage of too strong a current.

THE WEATHER IN JANUARY, 1883.

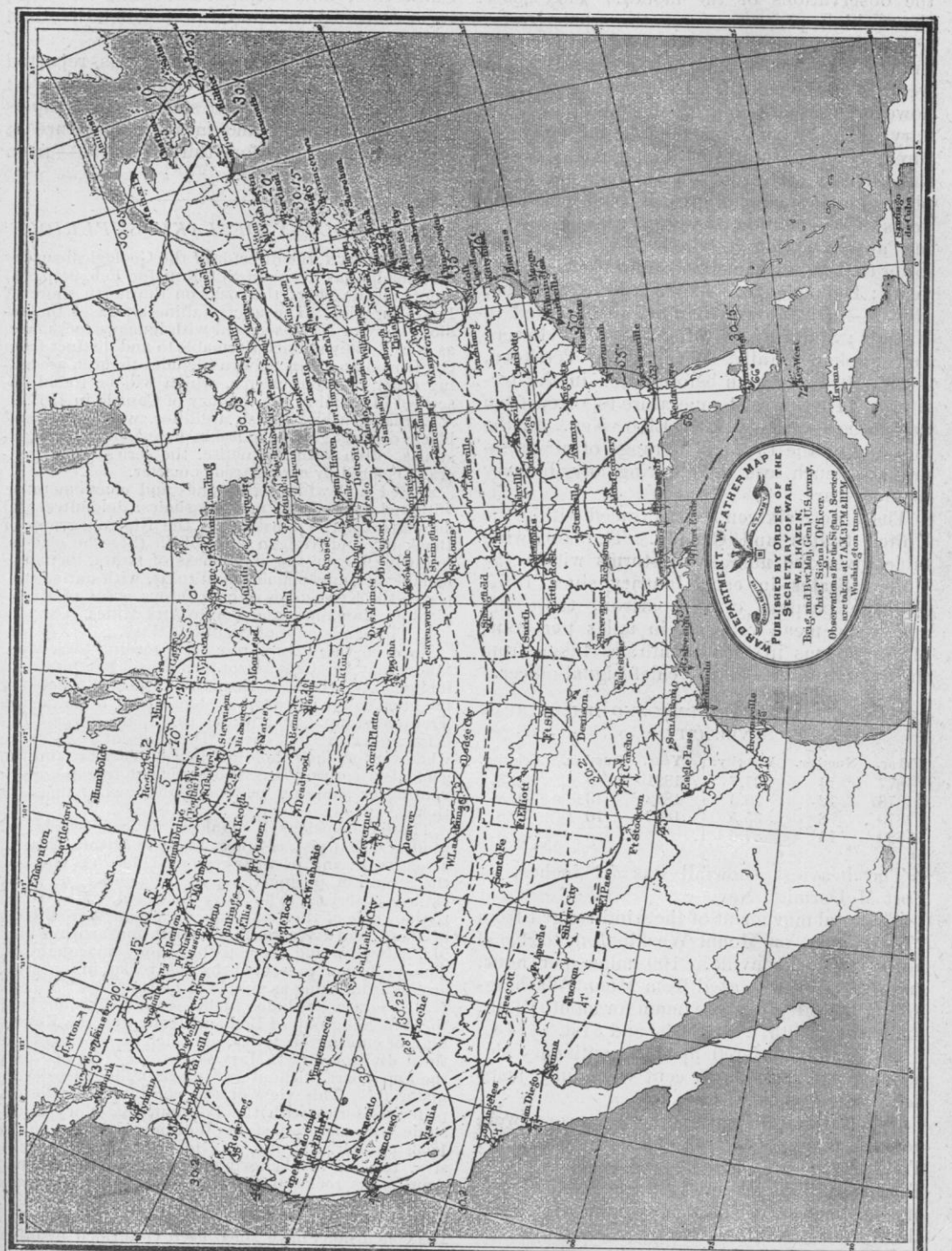
The monthly weather-review of the U. S. signal service contains copious statistics of the meteorological conditions, as observed at 171 regular stations in the United States and Canada, 224 stations occupied by voluntary observers, and 56 army-posts, besides various other sources of information. The following are given as the special features for the month: —

The very low mean temperatures. The departures from the normal are most marked for the upper lake-region, the upper Mississippi and Missouri valleys. The average temperature for all the districts east of the Rocky Mountain range was 3.3° below the normal.

The excessive rainfall over the south Atlantic and east Gulf states, with a marked deficiency in California.

The heavy snow-storms in the west, blockading or impeding all railroad traffic.

The chart on the opposite page has been reproduced by permission of the chief signal-officer from the regular chart No. III. of the signal-service series. It contains lines of equal air-pressure reduced to sea-level, lines of equal temperature unreduced, and mean



MONTHLY MEAN ISOBARS, ISOTHERMS, AND WIND-DIRECTIONS, JANUARY, 1883. REPRINTED IN REDUCED FORM BY PERMISSION OF THE CHIEF SIGNAL OFFICER.

monthly wind-directions as estimated from the observations of the month. This chart shows high pressures over the whole country, with northerly and north-westerly winds, the two combined producing the generally cold weather of the month. The extremes of cold, however, were not so great as is usual in January. The mean lowest minimum temperatures, from 47 stations of the signal-service in the different states, is −6.8°, while the same places indicate a mean greatest cold for all the years of observation of −13.3°. The following are exceptions: Pike's Peak, −37°, 4° lower than in the same month for the last eight years; Dubuque, Io., −26°, 2° lower; Pioche, Nev., −17°, 3° lower than before observed in Nevada; Santa Fé, N. Mex., −13°, 4° lower; and Spokane Falls, Washington Territory, −28°, 20° lower than before noted in the territory. The lowest temperature reported from any station was −54°, at Elko, Nev., on the morning of the 19th. The range of air-pressure was much less than during any January for five years.

There were sixteen storms traced within the United States and Canada. The following table gives the number of storms within the United States in each January since 1877. For the purpose of comparison, there are added the mean velocity, in miles per hour, of the storms in each month, as taken from the annual reports of the chief signal-officer.

TABLE OF JANUARY STORMS AND THEIR MEAN VELOCITY.

Year.	Number.	Velocity.	Year.	Number.	Velocity.
1877	14	37.7	1881	9	32.3
1878	12	26.3	1882	13	42.8
1879	8	35.5	1883	16	39.8
1880	14	37.6			

The heaviest snowfall was 52 inches, at Fort McDermitt, Nev.

The total movement of the wind ranged from 27,561 miles, on Mount Washington, to 1,853 miles, at Jacksonville. 100 miles per hour, and over, were reported from Mount Washington on the 3d (152, maximum for month), 4th, 12th, 18th, 20th, 21st, 24th, and 31st.

There were ordered up 149 cautionary signals, of which 79.9 per cent were fully justified.

No marked displays of the aurora were noted. Sun-spots were reported by Mr. D. P. Todd of Amherst, Mass., as seen on 11 days. They were least numerous at the first and last of the month, with a maximum frequency about the 16th.

An earthquake-shock was felt early on the morning of the 11th in Nashville, Jackson, Clarksville, and Memphis, Tenn.; Paducah, Ky.; Cairo, Anna, and Collinsville, Ill.; and at St. Louis and Protem, Mo.

A drought of great severity was reported from parts of Maine and Vermont.

Among numerous other statistics, are tables of monthly rainfall and mean temperature at Sacramento, Cal., for thirty years, — from 1853 to 1882 inclusive.

THE GEOLOGY OF LAKE SUPERIOR.

MR. SELWYN, the director of the Geological survey of Canada, has given in SCIENCE for Feb. 9 (p. 11) a note on the age of the rocks on the north shore of Lake Superior. The uncrystalline strata of the region, more or less associated with igneous rocks, are, as is well known, unconformable to and distinct from the Huronian. Mr. Selwyn includes them in ascending order in three groups, which will be found described in detail in the Geology of Canada in 1863.

1. Blackish and bluish argillites, with chert, and black or dark-gray magnesian limestones and sandstones, often with magnetite, the series being generally colored by carbonaceous matter.

2. Red and white sandstones and conglomerates, with red, white, and mottled shales, dolomites, and dolomitic marls, constituting the Nipigon group of Black bay and Nipigon bay. With these he classes, following Logan, the great mass of strata, including melaphyres, amygdaloids, and tufas, with native copper, — the Keweenian or cupriferous series of Michipicoten, Mamainse, and Pointe Aux Mines.

3. The sandstones of Sault St. Mary.

Between these three groups, according to Selwyn, 'there may be slight unconformities;' but he would include the whole of them in "those divisions of the great lower paleozoic system which underlie the Trenton group," and would call them lower Cambrian; asserting that there "is at present no evidence whatever of their holding any other place in the geological series," and "no sufficient reason for inventing or adopting new and unknown names for them."

These conclusions, it should be noticed, are arrived at after a first visit of a few weeks to certain parts of a vast, new, and peculiar region, which has engaged the attention, during the past forty years, of many skilled observers, who have collected, with regard to the whole of the Lake Superior basin, a great body of facts, and have reached conclusions with which Mr. Selwyn would seem to be wholly unacquainted. The problems presented by the rocks in question are far from being as simple as he supposes.

Mr. Selwyn includes in his second division both the Nipigon group of Bell and Hunt, and the Keweenian or cupriferous series, of which he conceives the third division, or St. Mary sandstone, "may be only the upper part, without any intermingling of volcanic material." This view of the continuity of the cupriferous series with the Potsdam (St. Mary) sandstone was maintained by Whitney; but Logan, in 1863, put forth strong, and to most minds conclusive, reasons for believing that the highly inclined cupriferous rocks at the east end of the lake pass unconformably below this sandstone (*Geol. Canada*, p. 85; also *Geol. report Canada for 1866–69*, p. 474). His conclusions have since been confirmed by other observers, notably by Strong and Irving in Wisconsin,

where the fossiliferous beds of the Potsdam rest horizontally on the upturned edges of the Keweenian, and are made up, in part, of its ruins. Parts 1 and 6 of the third volume of the Geology of Wisconsin (1880) will show the accumulation of evidence with regard to the stratigraphical relations of the Keweenian; and few will be found to-day to question the propriety of the conclusion announced by me in 1873, and subsequently by Major Brooks in 1875, that the copper-bearing rocks of northern Michigan constitute, in his words, "a distinct and independent series, marking a definite geological horizon," which has been designated the Keweenan series, Keweenawan, or, more euphoniously, Keweenian.

These rocks, so carefully studied by Brooks and Pumpelly on the south shore of Lake Superior, and largely displayed on Isle Royale, Michipicoton Island, Mamainse, and Pointe Aux Mines, on the north shore, were by Logan supposed to be the same with the red and white sandstone and marls, with dolomites and brine-springs, found along Nipigon Bay, Black Bay, and Thunder Cape. He recognized beneath these, in this region, the black slates, etc. (1 of Selwyn), which Logan supposed to form a lower subdivision of what he called the upper copper-bearing series, to distinguish it from the lower copper-bearing or Huronian series, which is overlaid unconformably by these black slates.

This lower subdivision, which I have called the Animikie group, though seen at Thunder Cape between the Huronian and the Nipigon series, is wanting in Black Bay, where Logan found the latter to rest directly upon the Laurentian; and also, according to Bell, on Lake Nipigon, where the Nipigon series reposes on Laurentian and Huronian. Apart from the evidence of its distinctness deducible from the absence of the Animikie in this area at the base of the Nipigon series, I have described a locality near Silver islet, where the basal beds of the Nipigon, resting upon the Animikie, hold pebbles of the characteristic rocks of the latter.

The mineralogical and lithological characteristics of the Nipigon rocks differ so much from the Keweenian as to create a suspicion that they may belong to two distinct series. In this connection an observation of Macfarlane is important. He found the true Keweenian at Mamainse to be uncomformably overlaid by a series of bluish sandstones and shales unlike those of the St. Mary series, and, on the contrary, closely resembling those of the Animikie group, to which he compares them. A summary of the evidence regarding these rocks will be found in my Azoic rocks (*2d geol. survey of Penn*, report E, pp. 230–241).

Meanwhile, it may be regarded as established that we have, in the Lake Superior basin, (1) the Keweenian or cupriferous series, resting unconformably upon the Huronian and other crystalline rocks, and (2) lower Cambrian (Potsdam) strata lying unconformably upon the Keweenian. We have, moreover, (3) the Animikie and (4) the Nipigon group, — two series of strata distinct from each other, and apparently from both of the preceding divisions. The observation of Macfarlane makes it probable that the Animikie belongs to a series newer than the Keweenian; in which case the lithological unlikeness of the still younger Nipigon group both to the Cambrian and the Ordovian (Siluro-Cambrian) rocks of the Lake Superior basin, would, as I have remarked in the report just cited, raise a suspicion that these red and variegated sandstones and marls, with dolomites and brine-springs, which we have called the Nipigon group, may belong to a higher geological horizon.

The name of the Quebec group was, as is well known, given by Logan to what, under the name of upper Taconic, had been long before described by Emmons as a great development of strata of the age of the calciferous and Potsdam divisions of New York. In the disturbed belt where this series is displayed, from the lower St. Lawrence to the Hudson-river valley, and beyond, it is now well known that there are included, besides rocks of this horizon, others of Trenton-Loraine (Ordovian) and of lower Helderberg age, together with older rocks, embracing the lower Taconic of Emmons and the still more ancient crystalline (Huronian) schists called by Logan 'altered Quebec group.' So far as known, there is nothing in this belt of disturbed, faulted, and often inverted strata which can be taken to represent the great Keweenian series. Logan, however, assumed the St. Mary sandstone to be of the age of the Chazy division of the New-York series, and then proceeded to call the underlying Keweenian calciferous or Quebec group, suggesting that the Kamanistiquia slates (Animikie series) might represent the Potsdam. These references, so far as regards the Chazy and calciferous, are embodied in Logan's maps of 1864 and 1866.

This view, which was never any thing more than a crude speculation, was soon shown to be untenable by the establishment of the Potsdam age of the sandstones overlying the Keweenian, both in Wisconsin, as we have already seen, and in northern Michigan, where Rominger finds these upper sandstones to be overlaid by calciferous and Chazy beds.

Unless we assume that every thing uncrystalline below the Trenton group is to be relegated to the Cambrian, there is no ground as yet for extending this name to the Keweenian; while the convenience of having a distinctive appellation for this vast metalliferous series will assure the name Keweenian a distinct and permanent place in geological nomenclature.

T. STERRY HUNT.

Montreal, March 3, 1883.

THE AINOS OF JAPAN.

THE following is an extract from an article on Yezo, in the transactions of the Berlin *Gesellschaft für erdkunde*, 1883, No. 1. The article was written by Professor Dr. Brauns of Halle, who, during his recent geological excursion to Yezo, visited the large settlement of Saghalin Ainos, in the neighborhood of Sapporo.

The Aino race belongs to a type entirely different from that of the Japanese, to whom they are now subject. The fear that the number of the Ainos is diminishing, in consequence of the immigration of the Japanese into Yezo, to an extent that would soon lead to their extinction, is not well founded. According to the estimate of the Japanese government, the total number of Ainos in Yezo, Saghalin, and the Kurile islands, is less than 18,000. While some authors have accepted this estimate, others have set the number of Ainos in Yezo alone as high as 50,000, which, with the addition of those now living under Russian control in Saghalin (from 10,000 to 12,000), and in the southern part of Kamtschatka, would give a total of from 60,000 to 70,000. Although the latter estimate, which is based on a number of reports from different sources (e.g., the missionaries of Hakodate), comes nearer the mark, still the number of Japanese who have settled in Yezo is already greater than that of the Ainos. The Japanese government reports 100,000

Japanese in Yezo, which, making the usual allowance for official exaggeration in matters of this kind, must probably be reduced to about 80,000. Be this as it may, it is certain that the fertile island of Yezo, which is appreciated in a certain way by the Japanese, but which is very irrationally and imperfectly utilized, is very thinly populated. The island has an area of nearly 80,000 □ kilometres, and a population of only about two to the square kilometre.

The Ainos — whose unsophisticated artlessness, love of truth, peaceful disposition, hospitality, and discreet, modest, and sober deportment, by contrast with other orientals, strike one all the more agreeably — show, in their short but well-proportioned body, thick and beautiful hair, and physiognomy, particularly in the deep-set eyes, unmistakable agreements with people of more western countries, say, central Asia. In language, as well as customs and traditions, they are decidedly strangers to the Japanese; but, so peaceful are they, they submit freely to the yoke that has been placed upon them, without ever plotting mischief. Whether for them, as well as for the rich natural advantages of the island of Yezo, a colonization in European fashion would be a great benefit in comparison with that of the Japanese, who have much to learn and much to do for a long time to come in their own country, may here be left undecided. However, such a wish will certainly appear natural to all those who have gained a more intimate acquaintance with the island of Yezo and its inhabitants.

INFLUENCE OF THE VAGUS NERVE UPON THE HEART.

In continuation of his studies upon the physiology of the frog's heart, Löwit confirms[1] Gaskell's discovery, that in normal diastole the cardiac muscle is not completely relaxed, but in a state of slight tonic contraction: this, Löwit finds, is abolished during vagus inhibition. The powerful beats which usually follow a period of inhibition must be due to some change in the heart-muscle, and not in its motor-nerve centres; for Kronecker has proved that every cardiac contraction is maximal. Their cause Löwit finds in the more complete diastolic expansion; and he also explains similarly the more vigorous pulsations sometimes seen during a vagus stimulation not powerful enough to alter the heart's rate of beat. He confirms Schiff's usually ignored discovery, that stimulating the pneumogastric sometimes quickens the pulse; but, after a careful study of the circumstances under which this phenomenon occurs, he rejects Schiff's hypothesis, that the vagus contains only one set of heart nerve-fibres, whose action varies with degree of stimulation, etc. We must assume two distinct sets of fibres, — a cardio-accelerator and a cardio-inhibitory: the latter are more irritable, but more easily injured, bearing thus the same relationship to the accelerator fibres as do the vaso-constrictory nerves to the vaso-dilator, according to Goltz. By exposing the frog's vagus to the action of substances, as nitre, which are known to diminish nerve irritability, one can turn the vagus into a pulse-quickening nerve: on washing out the nitre, it again becomes pulse-slowing; and so, back and forth, several times, until death-changes commence. In mammalia the phenomenon cannot be reproduced with the same certainty; but occasionally one can succeed in getting the vagus into a condition in which its inhibitory fibres are not irritable, while the accelerator are. During vagus acceleration the frog's ventricle becomes paler, indicating a contracted condition of its musculature even in diastole. This abnormal state of tonic contraction is not the cause of the acceleration, for the pallor may precede the pulse-quickening, or last after it; and weak stimuli sometimes cause acceleration with no pallor. The small pulsations usually seen during the acceleration are due to the increased tonicity of the heart-muscle usually present at the same time, and preventing diastolic relaxation of normal extent. The accelerator fibres probably act on motor-nerve centres in the heart, arousing processes, which, when feeble, merely alter the rate of beat; when more powerful, also increase the tonus of the heart-muscle.

H. Newell Martin.

[1] Pflüger's archiv, xxix. 469.

THE EXTINCT LAKE AGASSIZ.

In the recently published Tenth annual report of the geological and natural-history survey of Minnesota, for 1881, Prof. N. H. Winchell gives an abstract (p. 5) of Mr. Warren Upham's observations on the shore-lines of the great sheet of water that once flooded the valley of the Red River of the North, and overflowed southward into the Minnesota. "The lake had three stationary periods, forming three beaches. They all ascend above a given datum level toward the north, the rate increasing in going toward the north. The highest beach-line ascends 125 feet in about 150 miles, the beach being one continuous shore-line. The northern portion of the lake fell at intervals from this high beach-line, . . . while the water-level in the extreme southern part stood nearly stationary, the northern fractional beaches converging into one toward the southern extremity of the lake. The next distinct beach, found in the southern part of the region, ascends toward the north 70 feet in 150 miles. . . . The fall of the lake had therefore been sixty feet more at the northern than at the southern end. . . . The third beach-line, formed when the outlet had been excavated to the level of Lake Traverse, is known along a distance of 135 miles; and its northward ascent was at first 50 feet, and afterwards only about 25 feet. . . . The fall of Lake Agassiz from the highest beach level to the third at Lake Traverse was about 80 feet, and, in the vicinity of Maple Lake, 165 feet. . . . These phenomena seem inconsistent with that hypothesis which supposes an elevation of northern land as a barrier to contain this vast inland lake, inasmuch as these beaches would have to present a slope in the opposite direction, in order to change the outlet from Lake Traverse to Hudson's Bay. . . . They have been ascribed to the operation of the glacial period in the epoch of its decline, when the ice still existed toward the north as a barrier to prevent northern drainage; . . . and in the opinion of Mr. Upham, its attraction was sufficient to move the mass of water toward itself, and to cause an ascending shore-line in that direction. . . . Lake Agassiz probably covered Red Lake under 50 or 100 feet of water above its present level, Lake of the Woods under about 200 feet, the Red River Valley at St. Vincent 450 feet, and Lake Winnipeg about 600 feet." The area thus flooded is much larger than heretofore supposed.

LETTERS TO THE EDITOR.

Movement of the arms in walking.

It seems to me I can best lay this ghost of our animal origin by drawing attention to the fact that the swinging of any part that is sufficiently free may be

used for steadying the body in walking. In man the arms are used, because most movable; but in lower animals the head is most often used. The domestic fowl moves the head back and forth alternately with the movement of the legs; the horse moves the head up and down; the cow moves the nose back and forth.

Are these movements ghosts of a former real walking with the head? JOSEPH LECONTE.

Berkeley, Cal., March 7, 1883.

Suggested improvement in lighthouses.

The articles in SCIENCE during March, on the use of the electric light in lighthouses, recalls what I think is a most useful improvement suggested, or at least advocated, by an English yachtsman, — Mr. R. F. McMullen, — in a little book called the 'Voyage of the Orion.' In the vicinity of a powerful lighthouse, whether lighted by electricity or otherwise, the great glare of the light completely blinds the eye of the navigator. To remedy this, Mr. McMullen proposes that a colored shade should be fixed so as to change the color of, and diminish, the light within a fixed radius of from one to three miles, according to circumstances. Thus, besides the protection given the eye from too much glare within the radius of the shade, the navigator would also be warned that he was within a known distance of the light, — a consideration which would often be of much value.

I sincerely hope that our Lighthouse board may make some experimental trials of this plan, as well as turn its attention to the adoption of flashing lights, instead of revolving lights with long periods of darkness. Indeed, in our whole system of lights, and also of buoys and other 'day-marks,' we are behind the times. EDWARD BURGESS.

Boston society of natural history,
March 12, 1883.

Fluidal cavities in quartz-grains of sandstones.

It is interesting to note that the minute cavities containing a liquid and moving bubble, so common in the quartz of granite rocks, are also to be found in sandstones. This is especially the case with a hard, compact Potsdam sandstone quarried at Fort Ann, Washington county, N.Y. The cavities, though very minute, are abundant, and the included bubble very sensitive, being in a constant state of rapid movement. G. P. MERRILL.

U.S. national museum.

The copper-bearing rocks of Lake Superior.

In SCIENCE, No. 5, Professor Irving takes issue with my statement that there is no evidence whatever of the Lake Superior copper rocks holding any other place in the geological series than that which includes Potsdam and primordial Silurian or lower Cambrian.

In making the statement, I referred only to those parts of the north shore, extending from Sault St. Mary to Thunder Bay, which I have myself examined.

I could not presume to discuss, much less to dispute, the evidence which Professor Irving adduces, in disproof of my statement, from the St. Croix region and the south shore, neither of which I have ever seen; but I may be permitted to say, that the unconformities mentioned by Professor Irving, and which I have no doubt are real, do not, in my opinion, in the least invalidate my statement. Unconformities, even if locally very great, are not necessarily any indication of a great time-gap. And it seems to me that too much importance has been attached to these by Professor Irving, and far too little to the immense difference in the physical condition of the groups he now correlates; viz., the original Huronian of the north shore of Lake Huron, and Hunt's Animikie group, lower Cambrian of Thunder Bay, or, to come closer, the cleaved roofing-slates of Thompson in Minnesota, and the horizontal micaceous argillites, black dolomites, and cherty rocks, of Pie Island, McKay's Mountain, Thunder Cape, etc.

In Canada, at least, these two formations are absolutely and undoubtedly distinct, physically, mineralogically, and geologically; while the latter, as seen around Thunder Bay, is followed in almost conformable sequence by the red and white quartzose sandstones, conglomerates, amygdaloids, etc., of the so-called upper copper-bearing or Keweenian series of Hunt. These I have examined from Thunder Bay, around the north shore to Gros Cap, where they rest directly on the Laurentian gneiss, the Animikie group and the underlying Huronian being wanting. A short distance to the east, however, the latter appears in full force, but overlaid neither by Animikie nor by Keweenian (i.e., lower Cambrian), but by the Sault St. Mary sandstones, which, in view of their relation to the Black River limestone above them, and to the Keweenian in Gonlais and Bachewarmg Bays, are much more probably representative of the horizon of the St. Peters sandstone, or Chazy and calciferous, than of the St. Croix Potsdam. The respective limits of the two sandstones on the south shore seem uncertain.

The arrangement above indicated brings the whole succession of the Lake Superior, Cambrian, and Cambro-Silurian formations into perfect accord with that of the same formations in the Appalachian region, where, as I have elsewhere stated, indications of local contemporaneous volcanic action are not wanting at about the same horizon — lower Cambrian and upper Huronian — as that at which they occur in the Lake Superior region; the chief difference being, that the formations in the former region are folded and metamorphosed almost past recognition, and in the latter not more so than are many similar rocks of cretaceous and tertiary age.

I think, if Professor Irving could visit Michipicoten Island, he would be able to recognize plenty of volcanic detrital matter or tuffs among the copper-bearing rocks. The vast areas over which I have examined the ejectamenta of the extinct tertiary volcanoes of Australia enables me very readily to recognize such rocks when seen; but their occurrence at Michipicoten, and elsewhere on the north shore, is no proof that they also occur to the south, and therefore I fail to see why Professor Irving should dissent from my statement on this point.

ALFRED R. C. SELWYN,
Director Geol. and nat. hist. surv. of Canada.

Ottawa, March 14, 1883.

Snow-drifts.

Having often noticed the drifting of snow in parallel lines over the ice on our lakes, this explanation has suggested itself. Very often, when the wind drives the snow against any object, as a tree or fence-post, the snow will be hollowed out on the side toward the wind, and heaped up on the other side. This is explained by the fact that the tree acts as a reflecting surface, creating a counter-current of air, and preventing the accumulation of snow on the side toward the wind.

Might not the parallel ridges of snow on ice be explained in the same way? The first deposit of snow is caused by the flakes catching on some inequality or damp spot on the ice. This deposit acts as a re-

flector, and, by forming a counter-current, prevents another ridge forming near it, but favors the formation of a *parallel* ridge at a little distance. The second ridge thus formed acts in the same way as the first, and so on. After the first ridge is once formed, snow would accumulate on the side of it away from the wind, just as in the case of the tree.

JACOB REIGHARD.

La Porte, Ind., Feb. 27.

PREHISTORIC MAN.

Le Préhistorique: Antiquité de l'homme. Par GABRIEL DE MORTILLET, professeur d'anthropologie préhistorique à l'École d'anthropologie de Paris. (Bibliothèque des sciences contemp.) Paris, *C. Reinwald*, 1883. 642 p. 8°.

IN this latest and most important work of the distinguished *conservateur* in the prehistoric department of the *Musée des antiquités nationales de Saint-Germain*, we find exemplified in the highest degree both the merits and the faults of his previous writings. His merits consist in simplicity and elegance of style, and a marvellous capacity for the classification and arrangement of the innumerable details of an infant science, with whose minutiae he displays the most intimate acquaintance. This profound knowledge is combined with a very cautious and conservative spirit in accepting assumed facts, and is accompanied by an inexhaustible patience in their investigation. But as a counterweight to these high qualifications in a teacher of science, he displays a hastiness in his generalizations which will not wait for the slow and steady growth of knowledge, and a dogmatism which insists on forcing upon the world his crude speculations as the accepted truths of science. But what is even more unfortunate (although we can readily account for the existence of such a feeling in a man of science in France at the present time), his resistance to the reactionary spirit of clericalism seems to have resulted in a state of active and bitter hostility to all religion whatsoever. His attitude towards the bigoted and ignorant opposition of religious men to the overwhelming evidence of the antiquity of man can hardly be considered as '*dowered with the hate of hate, the scorn of scorn.*' He more than repays them in their own coin; as when he tells us that "the quaternary man *lived in peace*, entirely unprovided with religious ideas," or speaks of Cuvier as "the illustrious professor of the museum, creator of a new science, but doubled with a mediocre counsellor of state, posing as the defender of what then, as now, was called *the moral order.*" So we cannot help feeling that there must be a little personal pique to account for his sneer at 'certain great academies' which have not yet granted their letters of naturalization to 'palethnological studies;' and we can scarcely believe him to be serious in his complaint that these new doctrines have not yet found their way into the elementary text-books.

Upon the disputed points in prehistoric archeology he utters no uncertain sound. The first part of the work, embracing fifteen entire chapters, is devoted to 'The tertiary man,' although such a title seems to be somewhat inconsistent with his conclusion, that, "during the tertiary times, there existed a being intelligent enough to produce fire, and to fabricate instruments of stone; but this being was not yet a man." He was '*the precursor of man*,' — an ancestral form intermediate between him and the anthropoid apes of the present day. For this remote ancestor of ours, whose organic remains, he admits, have not as yet been met with, he has provided the long and learned appellation of the Anthropopithecus; and this achievement he modestly compares to Leverrier's discovery of a planet, or to the recovery by the philologists of the Aryans from the *débris* of their language. He even goes so far as to assure us that there were at least three species of this long-named creature, the first of which he calls A. Bourgeoisii, named from the late Abbé Bourgeois of Thenay, near Tours in central France, who has been most indefatigable in his search for traces of man in tertiary times. Then comes A. Ramesii, so called from M. Rames, who made a similar discovery near Aurillac in Auvergne. Finally there is A. Ribeiroii, whose appellative is derived from Col. Ribeiro, director of the geological bureau of Portugal, who believes that he has found traces of the existence of man, at that remote epoch, in the valley of the Tagus.

It is hardly necessary to state, that such very advanced Darwinianism as this does not represent the opinion and belief of the great body of students of prehistoric archeology the world over. The writer does not know of six men of science in Europe who accept 'the precursor of man.' The evidence that has sufficed to produce in the author's mind the conviction of his existence must be admitted to be very slight, although this does not appear to disturb him greatly. To the objection that the discovery in a certain locality, of objects that seem to bear traces of human workmanship, has not been confirmed in other places, he replies, that this is "an objection without foundation, since a fact can only be observed at one spot. It is like denying an eclipse because it is only visible upon a small portion of the globe."

We, however, are of the opinion that most students of prehistoric archeology look at the facts of their science in a very different spirit from this. They assert their existence, but wait until a sufficient number has been accumulated before attempting their explanation. Nevertheless, we must do the author the justice of admitting that he has been very severe and critical in his examination of the evidence of these facts, and will only allow its validity in the cases upon which he has founded his three species, rejecting all the many other alleged proofs of the existence of 'the tertiary man.' He largely relies upon the recent discovery by Professor Bellucci of Perugia, in the presence of several witnesses, of a flint flake *in situ* in a deposit alleged to belong to the upper miocene, at a place called the desert of Otta, not far from Lisbon. It would take more space than we have at our command to point out the weakness of this piece of evidence, which has been done elsewhere.[1] We will merely repeat, that "prudent investigators must hesitate to base the proof of a fact pregnant with such startling consequences upon no firmer foundation than a mere 'bulb of percussion.'"

The other disputed point in the new science, upon which the author takes decided ground, is in favor of the so-called 'hiatus' between the paleolithic and the neolithic periods. He believes, not only that a long space of time, during which great changes were effected in the climate and the fauna of Europe, elapsed between the two periods, but that the second is marked by the appearance upon the scene of a new and more advanced race of men, who with better tools and weapons, and aided by a knowledge of the cereals and the use of domesticated animals, gained the mastery over the autochthonous population of the earlier period. The contrary opinion maintains that the later race were developed from the former by a slow and gradual process. For our own part, we agree with the author's conclusion, believing it to be sustained by the preponderance of evidence.

As both a general statement and a minute account of the present state of knowledge in regard to prehistoric subjects, we know of no work superior to this. It is a complete storehouse of information, gathered by a master of the new science, who assisted at its birth, and has dwelt within its very penetralia. His statements in regard to facts can be relied upon most implicitly; it is only to some of his conclusions that we take exception.

[1] International review, September, 1882.

PINNER'S ORGANIC CHEMISTRY.

An introduction to the study of organic chemistry. By ADOLPH PINNER, Ph.D. Translated and revised from the fifth German edition by PETER T. AUSTEN, Ph.D., F.C.S. New York, *John Wiley & Sons*, 1883. 19+403 p. 8°.

CHEMISTS who are already familiar with Professor Pinner's *Repetitorium der (anorganischen und) organischen chemie* need not be informed of the peculiar excellences of that successful text-book, and will welcome Dr. Austen's translation, which makes it available to English-speaking students. This work presents, in a systematic and comprehensive manner, a review of the enormous number of substances derived from carbon, and especially indicates their mutual theoretical relations. Beginning with the compounds of the group C_1, the author describes, first, the simpler bodies, then their hydroxyl-derivatives, sulpho-derivatives, nitrogen-derivatives (amines, amides, urea, cyanides, etc.), phosphorus, arsenic and antimony compounds, and the so-called organometallic bodies; next follow the simpler substances of the group C_2, with their derivatives; and so on. The space given to any one body or topic is necessarily small. American students, with their utilitarian views, would probably prefer more descriptive matter in many cases, as in alcohol, sugar, starch, petroleum, etc. Practical matters are made subordinate to theoretical considerations.

The translation is clear and generally satisfactory, but not always free from traces of the original language. The translator follows the rules issued by the London chemical society as respects spelling, arrangement of constitutional formulae, and terminology. The work is exceedingly well printed, and very free from typographical errors. As a compendium of the present actual state of organic chemistry, for use in classes having a good foundation of inorganic chemistry, this work is well adapted, and deserves general acceptance.

REPORT OF THE CONNECTICUT SHELL-FISH COMMISSION, 1883.

Second report of the shell-fish commissioners of the state of Connecticut to the general assembly, January session, 1883. Middletown, *Pelton & King*, 1883. 44 p., map. 8°.

IN natural accordance with the reputation of its inhabitants for sound common sense applied to business matters, the state of Connecticut enjoys the distinction of being the first to appoint a commission to supervise its interests in the fisheries of economic mollusks. The

second report of that commission has just appeared. The most important work upon which the commissioners have been engaged is that of mapping the grounds within the state limits suitable for the cultivation of oysters, and assigning the same to those engaged in that industry, upon the payment of an almost nominal fee. Natural beds, or those which have been so within ten years, are exempted from assignment. The immediate result of this policy is to give to the oystermen a property in the ground they use, protection against encroachment, and security in the possession of improvements thereon. This, in time, will largely increase the yield of this valuable food-supply, and add to the taxable resources of the state. At a time when the beds of the Chesapeake are perilously near a destruction, which, under the present conditions of folly, ignorance, and greed in those most interested, is inevitable, the action of the state of Connecticut assumes a national importance. The work of surveying the coast with the co-operation of the U. S. coast survey has been actively carried on, and in its most important features has been carried out for that part of the shore west from the Connecticut river. By the commencement of the working-season of 1883, it is believed that 90,000 acres of oyster-grounds will be held by cultivators under state jurisdiction. A new mode of cultivation, or capture of spat for seed on muddy bottoms, has been invented at Groton. Birch-trees of fifteen or twenty feet in height, and three or four inches in diameter at the butt, are thrust about three feet into the mud, with the tops under the surface of the lowest water, and inclined at an angle of some 45° with the current. The floating spat attaches itself to the branches, and grows rapidly; a single bush affording, in a few months, five to fifteen bushels of seed-oysters, none of which would have survived settling on the muddy bottom. An absurd claim was made, that these submerged bushes produced scarlet-fever and diphtheria, and many were destroyed; but the plan has recently received legal recognition, and, with proper effort, can be made to produce millions of bushels of oysters where is now only waste ground.

The oyster-business in all its branches has attained greater perfection in Connecticut waters than in any other part of the country. It is usually very profitable, but subject to unexpected and sometimes ruinous losses. Thousands of bushels of oysters have been destroyed on one patch in a week by starfish. A firm is mentioned which in two years, off Charles Island, has lost oysters valued at one hundred thousand dollars. The starfish seem to move in crowds, which scatter when they reach a bed, and devour all before them. One fisherman, while searching for them, came upon an immense bunch, and gathered in seventy-five bushels of starfish in a short time, thus saving his bed. The coot (Fulica atra), it has been discovered, feeds upon young starfish, and its protection is recommended. The drill (Urosalpinx cinereus Stimps.) and periwinkle (Sycotypus canaliculatus Gill), as well as the drumfish, are reported to do but inconsiderable damage, especially in the deeper waters. The pollution of rivers falling into the Sound, the dumping of mud dredged out of harbors, and oyster-thieving, are referred to, and legislative regulations suggested. The propagation of the oyster has been attempted, but thus far with little prospect of success, on account of the extreme minuteness and delicacy of the embryos. Without radical improvement on present methods, this branch of the subject offers no grounds for belief in its practical application to economic purposes. The report contains a map of the triangulation executed, and an appendix of statutes bearing on the general topic.

WEEKLY SUMMARY OF THE PROGRESS OF SCIENCE.

ASTRONOMY.

Comet (Brooks-Swift). — The spectrum of this comet was examined at Lord Crawford's observatory, Dun Echt, Scotland, on the evening of March 1, and found to be fairly bright, and to consist of the usual three bands. — (*Dun Echt circular*, No. 71.) D. P. T. [473

The mass of Jupiter. — In a paper published in the Proceedings of the Royal Swedish academy (1882), Dr. Backlund develops the formulae by which the correction to the mass of Jupiter may be derived from heliometric observations of the distances and position-angles of the satellites *inter se*, and not, as usual, from the planet. He is engaged upon a new determination of this character. The chief advantage in this method is, that measures of the star-like satellites from each other are much less likely to be affected by constant errors than are measures of the satellites from the planet. The number of unknown quantities in his final equations is twelve; six observations, at least, being required in order to obtain all the corrections to the elements. — (*Copernicus*, Feb.) D. P. T. [474

MATHEMATICS.

Complexes of the second degree. — Herr Stahl gives a synthetic treatment of certain points in connection with Kummer's sixteen-nodal quartic surface. The processes are new; but, for the most part, the results are well known. — (*Journ. reine angew. math.*, xciii.) T. C. [475

Rotation of a liquid ellipsoid. — In two articles Mr. Greenhill has examined the conditions to be satisfied in order that a liquid ellipsoid may rotate about an axis other than a principal axis, and have a free surface. The axis of rotation, as stated by Riemann, lies in a principal plane of the ellipsoid. The motion is supposed to be set up in the liquid by mechanical processes; and the pressure at any point is investigated, the liquid being supposed contained in a rigid shell. The conditions are then investigated that are requisite for the ellipsoidal shell to be a surface of equal pressure, and that a free surface can exist. — (*Proc. Cambr. phil. soc.*, 1882.) T. C. [476

Non-Euclidean geometry. — Dr. Story has shown, in a previous paper, how the formulae of a non-Euclidean plane trigonometry could be deduced from those of the Euclidean spherical trigonometry; viz., by the replacement of each side by a constant multiple of that side, and each angle by a constant multiple of that angle. In the present paper he makes the corresponding deduction for any non-Euclidean spherical trigonometry, and also gives a number of formulae relating to distances, areas, etc. A new and important principle is exhibited; viz., *the distance (or angle) between any two geometrical elements (points, planes, or straight lines) is, to a constant factor près, the same, in whatever way it is measured.* For example, the formulae show that the distance of a given point from the nearest point in a given plane is proportional to the angle between the given plane and the nearest plane through the point (i.e., that which makes the least angle with it); the least (or greatest) distance from a point of one of two given straight lines to a point of the other is proportional to the least (or greatest) angle which a plane through one of the straight lines makes with a plane through the other; and, if the lines intersect, this is proportional to the angle between the lines, etc. Expressions are given for the circumference and area of any circle, the area of any spherical polygon, the surface and volume of any sphere; it is also shown that the double plane is identical with a sphere of *quasi*-infinite radius. A further abstract will be given on the completion of the paper. — (*Amer. journ. math.*, v.) T. C. [477

PHYSICS.

Acoustics.

Vibratory movement of bells. — Mathieu has recently studied the vibrations of bells, with a preliminary investigation of the vibrations of bent bars, considering the case of an ordinary bell in which the thickness in any meridian increases from summit to base. Between the vibratory movement of a bell and that of a plane plate, the essential difference exists, that, while in the latter the longitudinal or tangential movement and the transverse movement are given by independent equations, in the former, the normal and tangential motions are given by three equations which are not independent. The pitch of the notes of a bell does not change if the thickness varies in the same relation throughout every part: since the terms depending on the square of the thickness may be neglected; at least, for the graver partials. It is impossible to construct a bell so that it shall vibrate only normally; and, with a hammer, the tangential vibrations are of the same order as the normal vibrations. A purely tangential motion can be realized only with a spherical bell of constant thickness. — (*Journ. de phys.*, Jan.) C. R. C. [478

Vibrations of solid bodies in contact with liquids. — F. Auerbach has investigated the effect of liquid contained in a glass vessel upon the pitch of the sound produced when the latter is set into vibration. He reaches the following results: 1. The geometrical lowering in pitch (ratio of number of vibrations), produced by a liquid contained in a cylindrical glass completely filled by it, is less in proportion as the pitch of the empty glass is higher. 2. The arithmetical lowering of pitch with a cylindrical glass of mean pitch is approximately proportional to the reciprocal of the square root of the number of vibrations of the empty glass. 3. The lowering of pitch, when the glass is completely filled, is not noticeably dependent on its height. 4. The geometrical lowering of pitch produced in cylindrical glasses of different widths is greater in proportion as the glass is narrower. 5. The arithmetical lowering of pitch with cylinders of different widths is inversely as the square root of the width. 6. The arithmetical change of pitch is inversely proportional to the square root of the number of wave-lengths of the sound given by the empty glass contained between the walls and axis of the cylinder. 7. The lowering of pitch is greater as the density of the liquid is greater. 8. It is greater in proportion as the compressibility of the liquid is less. — (*Ann. phys. chem.*, 1882, xiii.) C. R. C. [479

Optics.

(*Photometry.*)

Solar photometry. — M. A. Crova has recently made some comparisons of the relative brilliancy of the sun and of a Carcel lamp. He compared the lighting-power of different wave-lengths in the two spectra, thereby deducing curves for each. The areas enclosed by these curves then represented the total amount of light given out by each source. He then deduced the factor by which it was necessary to multiply the smaller ordinates in order to render the two areas equal. The ordinate of intersection of the two curves of the same area then furnished at once the wave-length whose photometric comparison would give the ratio of the total light emitted by the two sources. This wave-length (582) is situated in the yellowish-green, and may be isolated by transmitting the light through a mixture of the solutions of perchloride of iron and chloride of nickel. The two lights thus obtained were of precisely the same color, and their ratio was at once determined by measurement with a Foucault photometer. After making all corrections, this method gives about 60,000 carcels (600,000 candles). — (*Comptes rendus*, Dec. 18, 1882.) W. H. P. [480

Electricity.

Electric amalgamation. — In the process of obtaining gold by amalgamation from ores containing arsenic and certain other impurities, the mercury 'sickens,' and fails to take up all the gold present. Mr. Richard Barker has devised a method of amalgamation which has given very satisfactory results. The inclined table over which the ore is washed contains hollows filled with mercury; over these, in the water containing the washings, copper wires are introduced, and brought so near that a powerful current may be passed to the mercury, which seems to gather itself away from the impurities, and to act more energetically upon the ore. — (*Iron*, Feb. 9.) J. T. [481

Relation between viscosity and galvanic resistance. — Mr. L. Grossman applies formulas deduced by him in a former article (*Ann. phys. chem.*, 1882, xvi.) to the analysis of experiments made by Grotrian, Kohlrausch, and others, on the temperature curves of internal friction and galvanic resistance in fluids, obtaining what he considers accurate determinations of twenty-five temperature co-efficients for each of these properties in solutions of six different salts; hence he concludes, that, for these solutions, the temperature curves of these two properties are equal. — (*Ann. phys. chem.*, 1883, i.) J. T. [482

Molecular theory of magnetization. — D. E. Hughes, in a lecture before the Institution of mechanical engineers, says that if a coil be placed at right angles with a plane circuit containing a soft iron wire, which passes through the centre of the coil, torsion of the wire induces currents in the coil which are reversible with the direction of torsion, but independent of its amount. A steel core does not respond in this way to torsion: hence, by analogy of the effects produced by inclining the core to the plane of the coil, the lecturer argues a greater molecular rigidity in steel than in iron. Attention was called to the fact that the coercive power of iron is greater than that of steel if the inducing forces are 'within the range of iron.' Iron, on being twisted or subjected to longitudinal vibration, lost its magnetism, steel did not. The magnetic properties of iron were illustrated by a glass tube containing iron filings, which lost its residual magnetism on being shaken or carefully rotated. The greater molecular rigidity of iron alloys was compared to the properties of the tube when petroleum was poured in among the iron filings, greater coercive power being thus attained. These facts go to support the theory that steel is an alloy of iron and carbon. — (*Iron*, Feb. 2.) J. T. [483

ENGINEERING.

Stability of brick conduits. — Mr. A. Fteley contrasted the theory on which the designing of brick conduits is based with the actual conditions under which such structures are built. Sewers and conduits are often built in ground more or less yielding, and the action of the earth about them is an important element of their stability. Under such conditions, such structures must move more or less after being built, and the conditions of stability must be very different from what they appear to be from a study of the original drawing. A study of the changes of form, by means of exact measurements made during construction, might point to defects due to the design or mode of construction, to the ground in which the sewer or conduit is built, or to the want of care or skill in the builder.

The author presented a diagram of an apparatus, showing, *in full size on a section drawn at a small scale*, all the deviations of the brick-work from the true line of section. The exaggerated distortion of the outline defines very clearly the slightest defects in construction or the movement of the structure. Diagrams were exhibited showing distortions in a conduit nine feet in width and seven feet eight inches high, and were taken at points where the conduit was built in firm, dry ground, in yielding ground, in wet trenches, on platforms in swampy land, and on high artificial embankments. From these diagrams and the distortions they exhibited, the defects in construction and design, in different locations and under different loads, were explained. The tendencies of the structure to spread under different conditions was alluded to; also the section of excavation on yielding ground best suited to prevent movement.

An instance of the successful underpinning of a brick conduit was described. A large quantity of water broke in between the outside of the brick-work and the sheet-piling supporting the trench, and washed away the sand forming the foundation for a length of about thirty feet, leaving it without support for that distance. A very simple and efficient means was described by which this space was filled with a grout of Portland cement. — (*Bost. soc. civ. eng.; meeting* Feb. 21.) [484

Steel castings. — M. A. Pourcel described recently, before the Iron and steel institute of Vienna, a series of experiments upon steel castings. He stated that the chief points to which attention is now directed are, increase in the size of the castings, and improvements in the methods of annealing and tempering in order to endue the casting with the highest mechanical qualities corresponding to the chemical composition. The last progressive step was the casting of cylinders for a Paris firm, 2.04 m. in diameter, over 2 m. long, and 55 mm. thick. These cylinders supported a pressure of forty-five atmospheres without showing signs of percolation. — (*Engineering*, Dec. 8, 1882.) G. A. H. [485

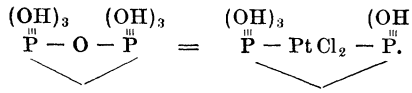
Screw-propeller blades. — The use of manganese bronze as a material for screw-propeller blades is rapidly extending. The first run of the 'Alaska' from Queenstown to New York in less than seven days was made immediately after her steel blades had been replaced by blades of manganese bronze. The great qualities of manganese bronze are its strength, and its freedom from corrosion. Recent experiments show that it has a transverse strength about double that of gun metal, and also, up to the elastic limit, double that of steel. The cost of manganese bronze is about double that of steel; but it is claimed that propeller-blades made of the bronze will last during the lifetime of the vessel, while steel blades require renewal every three years. — (*Engineering*, Jan. 5.) G. A. H. [486

CHEMISTRY.

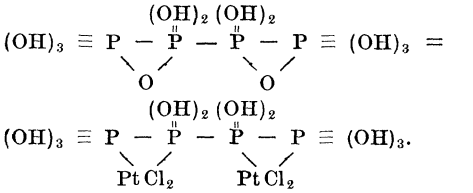
(General, physical, and inorganic.)

Formation of carbonic oxide. — Dr. L. P. Kinnicutt suggested a modification of Noack's method (*Berichte deutsch. chem. gesellsch.*, xvi. 75) for the preparation of carbonic oxide. He found that this gas was freely evolved when magnesia alba was heated in a retort with zinc-dust, and that it contained a small percentage of carbonic dioxide. — (*Harvard chem. club; meeting* March 13.) [487

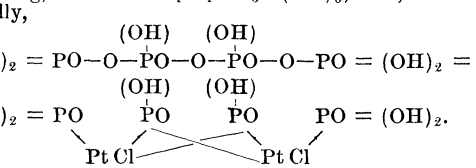
On the probable existence of new acids containing phosphorus. — Concerning the replacement of oxygen by platinous chloride in certain forms of phosphoric acid, Prof. W. Gibbs made the following suggestions: "Schützenberger described, some years since, a remarkable series of compounds in which platinous chloride ($PtCl_2$) replaces a molecule of chlorine or an atom of oxygen. Thus we have $PCl_3 . PtCl_2$ chemically equivalent to PCl_5. The corresponding acid is $P . PtCl_2 . (OH)_3$, which may be regarded as a derivative of $PO(OH)_3$. The same chemist obtained three other analogous acids, having respectively the formulas $P_2 . PtCl_2 . (OH)_6$ (corresponding to the chloride $2PCl_3 . PtCl_2$), $P_2 . PtCl_2 . (OH)_5$, and $P_2O_2 . PtCl . (OH)_3$. In all these cases we have the chemical equivalence $PtCl_2 = 2Cl = O$. Hence, following up the relation suggested by the equivalence expressed by $P . PtCl_2 . (OH)_3 = P . O . (OH)_3$, it seems at least probable that there are modifications of phosphoric acid expressed by the structural formulas, —



The formula $P_2 . PtCl_2 . (OH)_5$ is structurally unsymmetric, and must be doubled; so that we have $P_4 . 2PtCl_2 . (OH)_{10}$, or



Finally, in the acid $P_2O_2 . PtCl . (OH)_3$, we have $PtCl = 3Cl$, and therefore $2PtCl = 3O$. Hence, doubling, we have $P_4O_4 . O_3 . (OH)_6$, and, structurally,



It is easy to see that in the last four acids we may expect to find a marked influence of *position*, depending upon the different modes of union of the hydroxyl." — (*Harvard chem. club; meeting* March 13.) [488

METALLURGY.

Action of sunlight upon silver amalgamation. — By the process as usually conducted, native sulphide of silver is converted into chloride by treatment with mixed sulphate of copper and common salt. The chloride so formed is decomposed and amalgamated by mercury. M. P. Laur, of Rodez, has investigated this matter in the laboratory. In a glass vessel he placed a solution of common salt and sulphate of copper; a porous vessel filled with mercury was suspended in it, and a platinum electrode dipped into the mercury; the second electrode was a leaf of sulphide of silver, and was dipped into the copper solution. The electrodes were connected with a galvanometer, and the needle was found to swing according to the intensity of the light. The cupric chloride was changed by the mercury to cuprous chloride; and the latter acted upon the silver sulphide only in the presence of sunlight. — (*Iron*, Dec. 22, 1882.) R. H. R. [489

Petroleum as a blast-furnace fuel. — E. W. Shippen, of Meadville, recently built a small blast-furnace for testing petroleum. The furnace was 35 ft. high, 3 ft. hearth, 5 ft. bosh. It was fired with dried wood, iron-ore, and limestone. Hot oil was injected at the tuyeres under 16 lbs. pressure in the form of a spray. The white-hot charcoal, when struck by the hot oil, turned as black as if cold water had been thrown upon it. The experiment does not appear to have been a success. — (*Iron*, Dec. 29, 1882.) R. H. R. [490

Aluminum. — A recent patent by Mr. Morris of Uddington, N.B., claims to have solved a problem which has long baffled the skill of technical chemists. By heating an intimate mixture of alumina and charcoal in a current of carbon dioxide, Mr. Morris says that metallic aluminum is produced. The metal is purified from carbon and alumina by a second fusion. — (*Nature*, Dec. 21, 1882.) R. H. R. [491

GEOLOGY.

Lithology.

Crystals of serpentine. — Professor H. C. Lewis called attention to some interesting crystals of serpentine which occur in deweylite from Way's felspar quarry, Delaware. The crystals have a gray color, a pearly lustre, and an eminent basal cleavage almost micaceous. They polarize light, and are optically biaxial with a small axial angle, being probably orthorhombic. The blowpipe examination and analysis proved the mineral to have the composition of serpentine. The deweylite contains rounded masses of felspar partially altered into deweylite, together with sharp cleavage fragments of quartz, such as would be produced by throwing a heated crystal of quartz into cold water. The micaceous serpentine was the result of the alteration of mica, but, being crystallized, was not a true pseudomorph. The two points to which he desired to call special attention were the occurrence of serpentine in the crystallized state, and the direct alteration of graphic granite into magnesian minerals. — (*Acad. nat. sc. Philad.; meeting* March 13.) [492

MINERALOGY.

Bournonite. — A mineral resembling tetrahedrite, from Park county, Col., analyzed by W. T. Page, agreed essentially in composition with bournonite, and can be regarded as a variety in which most of the lead has been replaced by copper and zinc. — (*Chem. news*, xlvi. 215.) S. L. P. [493

Dopplerite. — Very carefully selected material of this organic mineral from Aussee, in Styria, has been investigated by W. Demel. He shows that the ash consists mostly of oxide of calcium, which is in chemical combination with the organic substance. The composition of the whole cannot be expressed by a simple formula; but the organic part is of an acid nature, agreeing with the formula $C_{12}H_{14}O_6$. — (*Berl. berichte*, xv. 2961.) S. L. P. [494

Native iron. — Small grains of iron accompanying gold from the gold-washings in Brush creek, Montgomery county Va., have been analyzed by W. T. Page. Absence of cobalt and nickel shows that they are probably not of meteoric origin; and evidence is given that they are grains of native iron, and not derived from the tools of workmen. Similar grains have also been separated and analyzed from auriferous sand from Burke county, N.C. — (*Chem. news*, xlvi. 205.) S. L. P. [495

Fergusonite. — This mineral, in fragments of tetragonal crystals from Burke county, N. C., has been analyzed by W. H. Seamon. From the analysis he derives the ortho-niobate formula $R'''NbO_4$. — (*Chem. news*, xlvi. 205.) S. L. P. [496

Orthite. — This mineral from Mitchel county, N.C., occurring in flattened crystals, has been analyzed by W. H. Seamon. The results of analysis showed a very small content of the cerium metals and a large quantity of calcium oxide. The formula derived was that of an ortho-silicate. — (*Chem. news*, xlvi. 215.) S. L. P. [497

Mimetite. — Colorless crystals of this mineral from Eureka, Nev., gave F. A. Marsie, upon analysis, the usual formula, $3Pb_3As_2O_8, PbCl_2$. — (*Chem. news*, xlvi. 215.) S. L. P. [498

METEOROLOGY.

Barometric laws. — An important contribution to this branch of meteorology has been made by Dr. Köppen of the Deutsche seewarte. Reviewing the work of Ley, as expressed by him in the eleven pos-

tulates published in 'The laws of the winds prevailing in western Europe,' he claims that three of these have been shown to be incorrect, while the others are confirmed. For these three he would substitute the following: "Mountainous regions, in spite of the copiousness of their rains, are visited by centres of depression more rarely than the surrounding lowlands and seas, — in general, there is not wholly wanting some influence of precipitation upon the depression; but this influence is not yet clearly defined, and in any case is but indirect."

Recent meteorological investigations justify the enunciation of four new theorems, which the author gives as follows: 1°. The direction of air-currents, in our latitudes, at the distance of from 500 to 3,500 metres from the earth's surface, is, on the average, nearly parallel to the isobars of that layer; in the lowest stratum it deviates from 0 to 8 points towards the side of the lower pressure, and, in the layer from 3,500 to 9,000 metres from the earth, from 0 to 2 points towards the side of the higher pressure, from the isobars of the respective layer. 2°. Since the pressure decreases with the altitude more slowly in warm than in cold air, the gradients, independent of their ratio to the pressure, are changed, as we ascend, in such a manner that an excess of pressure exists upon the side of the warmer air-columns. 3°. The advance of the depressions takes place approximately in the direction of that air-current, within it and approaching its path, which has a preponderance of accumulated energy. 4°. Since the conditions of motion at different heights of the vortex are different, there is required for its onward movement, not the state of motion of the lowest layer, but that of the sum total of layers. As the changes are continuous with the height, the state of motion of a certain mean layer, whose height is still to be determined, can in general be substituted for it. In support of these propositions, the author refers in detail to the works published in recent years by Terrel, Hann, Guldberg, Mohn, and others, and thus incorporates the results of the leading meteorologists of the present day. — (*Ann. hydr. und marit. meteor.*, 1882, heft xi.) W. U.

[499

Pressure of the wind. — An apparatus for measuring the pressure of the wind, which promises good results, is suggested by Dr. Sprung of Hamburg. It consists essentially of a hollow metallic sphere erected upon the top of a long rod, which is suspended at a point just above the centre of gravity of the apparatus. Pressure upon the ball is communicated to the rod, and may be recorded by a suitable registering-cylinder. — (*Repert. exp. phys.*, xviii. heft 12.) W. U.

[500

PHYSICAL GEOGRAPHY.

Australia. — The physical structure and geology of Australia is well summarized by Rev. J. E. Tenison-Woods. The southern side is low, or bounded by cliffs three hundred to six hundred feet high; the west is a tableland about a thousand feet in height; the north is a little higher; and the east averages two thousand feet elevation, and, near the south-eastern angle, bears the Australian Alps, with summits from six thousand to seven thousand feet. The interior depression is eccentrically placed near these mountains, and from them the slopes are sufficient to form the only large river-system of the continent. Elsewhere, whatever rain falls on the interior plains soon collects in shallow marshes, which are generally salt. Granite occupies most of the border-tablelands, but is sometimes replaced by vertical paleozoic or older slates and schists. These remain from a very ancient disturbance which had no connection with the present outline of Australia, and are at places overlaid by mesozoic strata. The great depression contains cretaceous strata, overlaid along the southern shore by a full series of marine tertiary deposits reaching three or four hundred miles inland, and as much as six hundred feet above sea-level. About contemporaneous with their rapid uplift a subsidence occurred, forming the castellated fiords and diversified scenery of Port Jackson, Broken Bay, etc. Extensive volcanic overflows are common nearly all around the tableland, and generally determine the direction of modern drainage. Their date is mostly miocene; but west of Melbourne they are much more recent, and ash cones and craters are frequently preserved. There are also scattered isolated masses of cross-bedded sandstone, forming flat-topped mountains, bordered by precipitous cliffs, so characteristic of Australian scenery. These are ranked as tertiary, or older eolian deposits, and are sometimes a thousand feet thick. Other land-formations are the tertiary drifts — often containing gold from the disintegration of the Cambrian and Silurian rocks, and sometimes buried under heavy lava-flows — and the recent sands and clays of the level half-desert regions derived from the weathered granite, covering a great part of the country. The sand lies in ridges, separated by the yellow clay flats, which a little rain makes very boggy.

The narrow strip of land between the plateau and the sea is generally well enough watered by streams to possess fertile alluvial plains, occupying most of its area. On higher ground the volcanic rocks, fortunately of considerable extension, yield the best soils. The colony of Victoria has the greatest share of these. Farther inland the lands are, as a rule, poor, except in river-valleys; and toward the central basin of the continent they are desert, like the Sahara. There seems to be good probability that artesian wells may be sunk here successfully. This is indicated by the occurrence of springs within the central depressed area. Their water is warm, indicating a deep source, and a supply from the slopes of the surrounding tableland. They form travertine deposits, in which the remains of gigantic marsupials are found. The paleontological evidence of the age of the several formations above named is given with some detail. — (*Proc. Linn. soc. N. S. Wales*, vii. 1882, 371.) W. M. D.

[501

Physical features of the Australian Alps. — A paper with this title, by J. Stirling, gives some introductory particulars of this range, about lat. 37° S., preparatory to further account of its geology and botany. Its culminating peak is Mount Kosciusko (7,256 feet), with companions in Mounts Bogong (6,508), Feathertop (6,308), and Hotham (6,100). These carry snow-patches through the summer. Below them are numerous plains at altitudes from 3,000 to 6,000 feet, possessing distinctly alpine features. In midsummer (February), when the lower valleys are languishing in excessive dryness, the rich volcanic soil of these flat highlands bears a luxuriant growth of alpine flowers and snow-grasses, giving excellent pasturage. During the rest of the year their climate is inhospitable, having sudden changes, severe frosts, and heavy snows. The present dividing-range is not regarded as the original axis of elevation, but has assumed its form by the erosion of a great miocene highland north and south of it, now remaining as isolated peaks, — Wills, Gibbo, Bindi, Baldhead, and others. The basis of this plateau is of crystalline schists and Silurian strata, overlaid by deposits containing miocene plants capped with basaltic flows, into all of which the rivers have cut

deep gorges. The rain, brought by southerly winds, was 58.59 inches on 154 days in 1880 at Grant (3,700 feet above sea-level in the basin of Mitchell River, south of the dividing-range), and 29.92 inches on 114 days in the same year at Omeo (2,108, altitude north of the range). The article is chiefly devoted to the detailed topography of the Mitta Mitta basin north of the divide. — (*Trans. roy. soc. Victoria*, xviii. 1882, 98.) W. M. D. [502

GEOGRAPHY.

(*Asia.*)

Northern Persia. — A plane-table route survey from Tehran to Astrabad, by Lieut.-Col. Beresford Lovett, British consul at the latter place, gives a considerable addition to the knowledge of the topography of that region. His way led generally along the northern slope of the Elbruz mountains, continually crossing over passes between valleys opening northward to the Caspian. Notes are given on the altitudes, distances, and roads between stopping-places; the character of the towns, and the supplies they afford; and very briefly on the appearance and structure of the country. On nearing Astrabad, the northern mountain slopes were found covered with luxuriant forests of elms, oaks, and beeches; but, on crossing the Shahwar mountains, on a second trip south-east from Astrabad to Shahrud, the country was found very dry and barren. At other points it was noticed that the moist winds from the Caspian formed clouds only on the northern sides of the mountain-ranges. It was found that the plains of the Lar (Harhaz) river, southwest of the great volcano Demavend, were formed as lake-beds during a time when lava-flows south of the volcano held back the river. A gorge has since been cut through the barrier, so that the lake has now disappeared. No granite or 'trap rock' was seen. The mountain summits were of compact limestone; and the valleys showed marls, sandstones, and shales. A geological section of very doubtful value is given of the mountains south of Astrabad. — (*Proc. roy. geogr. soc.*, 1883, 57; map.) W. M. D. [503

Eastern Turkestan. — This region was visited from India by Shaw in 1872, who was well received by the local authorities, and found good opportunities for trade; but further attempts at intercourse were stopped by the Mohammedan rebellion under Yakub Beg (Atalik Ghazi) against the Chinese. While this movement was successful, Sir Douglas Forsythe's mission crossed the mountains, and again found encouragement for commercial enterprise. A second interruption came on the defeat and death of Yakub Beg, and the reconquest of eastern Turkestan by the Chinese. Two years ago Ney Elias, British resident at Leh in Ladak, made the same trip, and met with no opposition. Lastly, Mr. A. Dalgleish, a merchant in India, conducted a trading-caravan across the mountains, and staid ten months in Kashgar, where he was well received, and successfully disposed of his goods. He has lately returned, and proposes to go again. — (*Athenæum*, Feb. 10.) W. M. D. [504

Tibet and the Sanpo. — One of the pundits trained for trans-Himalayan exploration has lately returned to India, with all his journals and instruments, after an absence of four years, in spite of the report, previously received, that his legs had been broken to prevent his further travels, and that his companion had been executed by the authorities at Lhassa. He was twice robbed of nearly all his property, and was twice forced to work for his support; but he took many observations for latitude, and recorded much of his route. After leaving Lhassa, the attempt was made to reach Lob-nor (Prejevalsky had not then been there). The farthest points reached were Saithang and Saitu (lat. 40°, long. 92°), thus failing of the object only by a comparatively short distance. On returning, he went to Batang, and desired to cross into Assam, but turned back, as savage tribes were reported on the frontier, and went westward toward Lhassa, stopping short of this place, however, for fear of being recognized there, and crossing the Sanpo at Tchetang. Gen. Walker, of the Indian survey, regards the route followed from Batang as giving good evidence that the Sanpo does not join the Irawadi: for, if it did, the pundit must have crossed it three times; while he is confident that he crossed it only once, and that a great range of hills cuts it off from the rivers on the east. — (*Proc. roy. geogr. soc.*, 1883, 99.) W. M. D. [505

(*Pacific Ocean.*)

Arctic currents. — Professor Davidson read a paper, prepared by Capt. Hooper, who commanded the 'Corwin' in the Arctic, upon the currents determined in his last cruise in Bering Sea, Bering Strait, and the Arctic Ocean south of Herald Island. The data were abstracted from the records of the vessel, and demonstrated the prevalence of a current setting through the Bering Strait to the Arctic. The observations were specially directed to this point; and Capt. Hooper's experience of the previous year, and his appreciation of the difficulties attending the question, add special value to his deductions on this question. The president recalled the results of former observations, weighing their relative values, and gave the fullest credit to the 'Corwin's' work. — (*Proc. Calif. acad. sc.; meeting* March 5.) [506

BOTANY.

Freezing of liquids in living vegetable tissue. — Mr. Thomas Meehan referred to the prevalent opinion that the liquid in vegetable tissues congeals as ordinary liquids do, and, expanding, often causes trees to burst with an explosive sound. Experiments on young and vigorous trees varying from one foot to three feet in diameter demonstrated that in no instance was there the slightest tendency to expansion; while, in the case of a large maple (Acer dasycarpum) three feet eleven inches and a half in circumference, there appeared to be a contraction of an eighth of an inch. In dead wood soaked with water there was an evident expansion; and the cleavage with explosion, noted in the case of forest-trees in high northern regions, may result from the freezing of liquid in the centre or less vital parts of the trunks. In some hardy succulents, however, instead of expansion under frost, there was a marked contraction. The joints or sections of stem in Opuntia Rafinesquei and allied species shrink remarkably with the lowering of the temperature, so that the whole surface in winter is very much wrinkled. Assuming as a fact that the liquids in plants which are known to endure frost without injury did not congeal, it might be a question as to what power enabled this successful resistance. It was probably a vital power; for the sap of plants, after it was drawn from them, congealed easily. In the large maple-tree already referred to, the juices not solidified in the tree exude from the wounded portion, and then freeze, hanging from the trees as icicles, often six inches long. — (*Acad. nat. sc. Philad.; meeting bot. sect.*, March 13.) [507

Autoxidation in living vegetable cells. — Traube has given the name '*autoxydable körper*,' or, as we must clumsily translate the new term, autoxidizable substances, to those bodies which, at a low

temperature, and by the action of free, passive oxygen, can be oxidized, forming, in the presence of water, peroxide of hydrogen. Starting from Traube's statement of the changes which accompany oxidation, especially the formation of peroxide of hydrogen, Prof. Reinke gives the following as a sufficient basis on which to build a theory of oxidation in living cells. (He has himself shown that there exists in certain plants, notably in the beet, a very easily oxidizable body, which he has named rhodogen. This substance is one of Traube's autoxidizable bodies, and is only one of many which may be reasonably assumed to be present in cells.)

1. In every active cell, autoxidators are formed; that is, substances which, at a low temperature, and by the action of molecular oxygen, can be oxidized in the presence of water.

2. By oxidation of these substances, peroxide of hydrogen is produced.

3. This peroxide of hydrogen can, under the influence of diastase, and probably of other ferments, cause further oxidations, just as atomic oxygen can.

Lastly, the seat of this activity is the periphery of the protoplasmic body of the cell; and this body possesses an alkaline reaction. — (*Bot. zeit.*, Feb. 2 and 9, 1883.) G. L. G. [508

Structures which favor cross-fertilization in certain plants. — Several are made known and discussed by Trelease. The protogyny, development of the anthers one after the other, and usual cross-fertilization by the jostling of the little plants caused by surface-currents of the water, are well made out. The singular arrangement in Hakea and other Proteaceae is worked out with new particulars; also a curious explosive arrangement in certain heaths, a new study of Salvia, and some remarkable arrangements in two Acanthaceous flowers, in one of which a slow change of position, in the other an irritable movement, insures cross-fertilization. The flowers were studied at the Botanic garden, Cambridge. — (*Proc. Bost. soc. nat. hist.*, March, 1882.) A. G. [509

(*Fossil plants.*)

Fossil wood from India. — Prof. A. Schenck enumerates the specimens of fossil wood collected in the East Indies by the brothers Schlagintweit. The greater number of these specimens, twenty, pertain to gymnospermous trees; one species represented by six specimens being identified as Nicolia aegyptiaca, Ung., which was originally described from the wood of the fossil forest of Egypt. Of the other specimens five are conifers, and two monocotyledonous, — palms. Of the conifers four specimens are described under the name of Araucaroxylon Robertianum, the other as Cedroxylon Hermanni. The two specimens of palms represent different species. — (*Engler's bot. jahrb.*, iii. 353.) L. L. [510

Cotta's species of Perfossus. — Prof. A. Schenk records the result of his researches on the original specimens, which Cotta had compared or referred to palms from the distribution of the fragments of fossil wood in the tertiary. The specimens do not appear to have been critically examined since Cotta, the names only being changed: Perfossus angularis, Ung. and Stenzel, for Perfossus; and Palmantes perfossus, Schimper, for Fasciculites perfossus. Perfossus costatus, Cotta, has not been mentioned by Schimper and Stenzel; Unger refers it to corals. From the researches of Prof. Schenk, it appears that the specimens from which Perfossus punctatus has been constituted by Cotta, represent two different species, — Stenzelia elegans, Goepp. (medullosa, Cotta) of the Cycadeae, and a species of palm, probably of the genus Phoenix. — (*Engler's bot. jahrb.*, iii. 484.) L. L. [511

ZOÖLOGY.

Coelenterates.

Peculiar method of budding in the Campanularidae. — The well-known tendency shown by certain hydroids, when kept in confinement, to throw out long tubular processes, which may subsequently become the foundations of new communities, is described in detail by Dr. Lendenfeld as exhibited in Campanularia and Gonothyraea. — (*Zool. anz.*, No. 130.) W. K. B. [512

Observations on Australian hydroids. — Dr. Lendenfeld writes that he has independently discovered in Australian Campanularidae the glandular ring which has been described in Eudendrium by Weissman and Jickeli. He has also verified the existence of Jickeli's 'ganglion-cells;' and he finds similar cells in the endodermal lining of the proboscis, where they are very numerous. The processes which they give off anastomose with each other so as to build up a definite 'nerve-ring' around the mouth. Lendenfeld regards this as the true central nervous system of hydroids. If these star-shaped corpuscles of hydroids are really nerve-cells, we have in these animals a central nervous system which is endodermal in its origin, and which is not homologous with the nerve-ring of the hydro-medusae. In the Campanularidae the endodermal ganglion-cells of the proboscis are joined to sensory cells, each of which carries a sensory hair projecting into the digestive cavity. — (*Zool. anz.*, No. 131.) W. K. B. [513

Mollusks.

Soft parts of Ammonites. — At the November meeting of the Liverpool geological association, a paper on Ammonites and the Aptychus was read by Mr. F. P. Marrat. That gentleman, after reviewing the subject as treated by others, concluded that it is probable that some species of Ammonites, perhaps those protected by a deep-water habitat, were destitute of these appendages, while others, perhaps littoral in their range, and more subject to attacks from predacious enemies, were provided with them. He considers them as opercular attachments to a 'hood' such as exists in Nautilus. Both calcareous and horny Aptychi have been found *in situ*. They are generally smooth or slightly striated; but in the Free public museum of Liverpool is a very fine example, from the lithographic slate of Solenhofen, with a distinctly granular surface, recalling that of the thick, granular hood of Nautilus. The appearance of the edges of the valves in this specimen, beautifully preserved, indicates that its margin was not free, as in gastropod opercula, but that it was partly imbedded in a cartilaginous lobe which fitted the margin of the aperture like the wavy margin of the hood in Nautilus. In this view the hypothesis that Ammonites were internal shells, like Spirula, would seem to be quite untenable, as no internal shell is known which has any opercular apparatus. — W. H. D. [514

Crustaceans.

Heterogenesis in Copepoda. — Under this title, C. L. Herrick, after calling attention to the wide geographical range of some species of Copepoda, and giving instances of species common to the fresh waters of Europe and North America, describes forms of Cyclops and Diaptomus apparently due to abundance of food, and other conditions of environment. In another note the same author refers to a blind non-

parasitic copepod, which he refers to the genus Braydia. — (*Amer. nat.*, Feb., 1883.) S. I. S. [515

Supposed larva of Limulus. — In his letters from the Challenger, the late Dr. von Willemoes-Suhm referred to a larva taken in the East Indies, supposed to be that of Limulus, but which he is said to have concluded afterwards to be the larva of some cirriped. Willemoes-Suhm's original figures and description of the larva are now published with a brief preface by E. Ray Lankester. The figures show that the later conclusion was undoubtedly correct, though the larva is very different from any cirriped larva previously figured. — (*Quart. journ. microsc. sc.*, Jan., 1883.) S. I. S. [516

Insects.

Sexual dimorphism in Psocidae and their salivary glands. — Besides the doubtful case mentioned by Westwood (Lachesilla), no instance of sexual dimorphism has so far been noted in the Psocidae. Bertkau now describes Psocus heteromorphus, in which the female has very rudimentary wings, while the male has wings longer than the body. Two new genera, Trocticus and Lapithes, are described and figured in the same paper. Kolbe, however, a few months earlier, described P. heteromorphus as Neopsocus rhenanus, and Lapithes as Bertkauia. — (*Katter's ent. nachr.*; *Arch. f. naturg.*, xlix. 97; *Herbst-versamml. naturh. ver. Bonn*, 1882.)

In the latter place Bertkau also discusses Burgess's so-called 'lingual glands' of Psocus and Atropos, regarding them simply as strongly chitinized areas of the mouth-cavity, possibly serving as salivary accumulators. Bertkau succeeded in finding in Psocus the true salivary glands, which Burgess, in alcoholic specimens, could not demonstrate. There are two pairs of them, each pair with a common duct. No figures are given; and the short notice does not seem to settle satisfactorily either the nature or the structure of the peculiar organs in question. — E. B. [517

VERTEBRATES.

Fatigue and nutrition of the heart. — Gaule has shown that a frog's heart, washed out with dilute solution of common salt until it ceases to beat, is rendered capable of further pulsation when dilute alkaline solutions are sent through it. Martius confirms this, but dissents from Gaule's view, that the alkali nourishes the heart. Its administration leads to a certain number of beats; but these soon cease, and a fresh supply of alkali is then inefficient, while other liquids, especially blood serum, lead to renewed cardiac contractions. Martius concludes that the frog's heart-muscle has in itself no store of energy-yielding material which it can call upon, but works at the expense of food-matters yielded it constantly by the liquid circulating through it. When the heart, irrigated with salt solution, ceases to beat, this is due to the saturation of its tissue with carbon dioxide while still some nutrient matter (blood) remains not washed out from the ventricular network. The salt solution, acting merely as a medium for physical diffusion, cannot remove the carbon dioxide as fast as it accumulates, and consequently the heart ceases to beat while it still has some available food. The alkali, on the other hand, chemically removes the injurious carbon dioxide; and the heart beats for a short time, using the food-stuff in the blood still present in its meshes. When the heart, treated with dilute alkali, ceased to beat, new pulsations could only be obtained when it was supplied with liquids containing serum albumen. Solutions of syntonin, glycogen, peptone, egg-albumen, casein, or myosin, were useless. Gaule had found solution of peptone efficacious. This Martius thinks must have been due to the fact that Gaule used an alkaline solution of that substance, and that the alkali was the efficient element in the liquid. — (*Du Bois' arch.*, 1882, 543.) H. N. M. [518

Influence of different blood-constituents on the beat of the heart. — Ringer withdraws his previous paper (*Journ. of physiol.*, iii.) on this subject in consequence of his discovery that the sodium-chloride solution with which he worked was not prepared, as he had believed, with distilled water. It was made with water supplied by the New river company of London, and containing salts, not only of sodium, but of calcium, magnesium, and potassium. When solution of Na Cl in pure distilled water was used, the results previously obtained failed to appear. On the other hand, the rounding of the apex of the curve of ventricular contraction, the prolongation of the curve, and the slow diastole previously described as due to sodium chloride, are all brought about by solutions of minute quantities of calcium salts in distilled water. A very minute quantity of potassium chloride prevents this effect of the lime-salts. A solution of Na Cl, K Cl, and Ca Cl_2 in distilled water is perfectly neutral, yet makes an excellent artificial circulating liquid for the frog's heart. This shows that alkalinity of the circulating medium is not necessary for contractibility. A lime-salt, the author concludes, is necessary for the manifestation of cardiac contractility; but, in the absence of potassium, calcium so prolongs the diastole as to lead to fusion of the beats, and imperfect action of the heart. Sodium bicarbonate cannot take the place of the lime-salts in maintaining the beat of the heart. — (*Journ. of physiol.*, iv. 291.) H. N. M. [519

Fish.

A remarkable deep-sea fish type. — A fish exhibiting a most remarkable combination of characters has been found by the naturalists of the Travailleur expedition off the coast of Morocco, at a depth of 2,300 met. It has a length of .47 met., and a height of 2 cm., the body tapering backwards like that of a macrurid. The cranial part of the head is short (3 cm. long); but the suspensorium and jaws are excessively elongated, the jaws being 9.5 cm. long. The mouth is consequently enormous. A long, slender style constitutes the upper jaw, and is supposed to represent the intermaxillary alone, or possibly the intermaxillary and maxillary amalgamated. The branchial apertures are represented on each side by "a very small orifice forming a simple, rounded, cutaneous perforation situated towards the level of the termination of the bucco-pharyngeal funnel." No fins are described. But the strangest features are revealed by dissection. The respiratory apparatus presents, it is truly said, a constitution which is at present unique in osseous fishes. We find six pairs of interior branchial clefts, and consequently *five branchiae*, each of which is provided *with a double series of free lamellae*. No hyoidean apparatus is developed. (Perhaps the hyoidean apparatus is represented by the anterior pair of branchial arches.) It is also asserted that there are no opercular pieces. Further, the suspensorium is said to be "composed of only two pieces, — a basal piece, the analogue of the temporal; and an external piece, no doubt representing a tympano-jugal." No pneumatocele was found. The form thus characterized has been named by Vaillant Eurypharynx pelicanoides, and is considered as the type of a new family (the Eurypharyngidae). Not only, indeed, does it represent a new family: its affinities are by no means

obvious. By Vaillant it is thought "that the fish presents relations with the Anacanthini, with certain Physostomi (such as the Scopelidae and Stomiatidae), and also with the Apodes." It has, in fact, features of resemblance with the forms noted, as well as with the Saccopharyngidae, but they are wholly superficial. Assuming, of course, the correctness of the characters attributed to Eurypharynx, we are compelled to regard it as the representative of a primitive type of fishes, and perhaps of a peculiar order related to the dipnoan and ganoid series. The examination of the brain, heart, viscera, and skeleton, especially the skull and scapular apparatus, will doubtless definitely determine its relationships. — (*Comptes rendus*, Dec. 11, 1882; *Ann. mag. nat. hist.* (5), xi. 67.) T. G. [520

Reptiles.

Development of the caudal region in lizards. — H. Strahl publishes a renewed investigation of the development of the neurenteric canal, allantois, and tail, in lizards. His researches were made on Lacerta agilis. The early embryonic disk consists of an anterior field in which the medullary groove is subsequently developed, and a posterior field containing the mass of cells forming the primitive streak. From the ectoderm of the front part of the streak is formed an invagination, which deepens and descends obliquely forwards. For some time the cells lining the invagination do not present a distinctly epithelial character, which leads Strahl to consider this lining mesodermic. The lower wall of the canal, thus formed, breaks through, establishing a connection with the entodermic cavity. The axial row of cells in the dorsal wall of the canal becomes elongated, making a thickened epithelial band, which is the *anlage* of the notochord. This *anlage* gradually extends itself farther forward. The neurenteric canal marks the hind limit of the medullary canal and of the chorda, and moves backward during further growth. It is entirely surrounded by mesoderm of the primitive streak. After the complete closure of the neural tube the neurenteric canal closes also. The primitive streak is directly concerned in the formation of the tail and of the allantois. The latter first appears as a solid mass of cells, which afterwards grows out into the pleuro-peritoneal space, and becomes hollowed. The chorda becomes separated from, and overgrown by, the entoderm, in the same manner as has been previously observed in other vertebrates. The caudal gut (*schwanzdarm*) lasts relatively long. Its communication with the intestine is aborted, but the connection with the neurenteric canal continues longer. Strahl argues against Küpffer's view that the neurenteric canal is directly concerned in the formation of the allantois. He also believes the homology drawn by Balfour between the primitive streak and neurenteric canal on the one hand, and the blastopore of fishes and amphibia on the other, to be erroneous. (His arguments on the latter point seem very defective, nor does he appear to thoroughly grasp the problem.) — (*Arch. anat. physiol.; anat. abth.*, 1882, 242.) C. S. M. [521

Permian reptiles. — Professor E. D. Cope exhibited additional remains of Permian reptiles belonging to the genera Diadectes, Empedias, and Helodectes. The scapular arch of Empedias molaris resembles that of the carnivorous type in having a very small coracoid bone. The episternum is very robust, and, ceasing at the anterior part of the arch, does not separate the clavicles below. The claws approach the ungulate type, and are admirably fitted for digging and shovelling. The vertebrae possess the hyposphen first observed in the Jurassic reptilia. In the Permian diggers this process formed a strong articulation between the vertebrae for the purpose of resisting shock; while, in the swimming Jurassic forms, it served to counterbalance the necessary lightness of the bones. The presence of such a structure in these two very distinct forms of life furnishes an interesting example of the employment of the same means to provide for varying necessities. The basi-occipital presents the usual reptilian articulations, and was lost from the specimens before described, which were supposed to have four articulating facets. — (*Acad. nat. sc. Philad.; meeting* March 13.) [522

Mammals.

Tongue of Perameles; origin of taste-bulbs. — The tongue of Perameles nasuta, a rare marsupial, contains numerous and remarkable sensory organs, which have been investigated by Edward B. Poulton. Towards the base of the tongue are three circumvallate papillae; the taste-bulbs, numbering 700 or more, lying in the papillary wall of the valla. In the papillae and around them are numerous serous glands. The axis of each papilla is formed by large ganglion, which contains only a few but very large cells, and gives off non-medullated fibres to the taste-bulbs. This is an important observation, since in the organs of sight and hearing there always intervene ganglion cells between the sensory apparatus and the central nervous system. May it not be also the case with all the gustatory organs? The taste-bulbs are comparatively simple, and appear to contain only one kind of cell. The fungiform papillae are chiefly arranged on each side in a single, irregular line; they very rarely contain taste-cells; but occasionally a few are found, which may lie close together, but are not united into a distinct taste-bulb. His observations have led Poulton to formulate the following theory of the origin of taste bulbs: the terminal organs in the mouth would be placed like similar organs in the skin; namely, in papillary ingrowths of the *mucosa;* hence the cells would lie together, and, in assuming the columnar form, they would converge towards the outer surface of the skin. The convergence of the cells would soon lead to their union into a bulb. One more step: differentiation of the central and peripheral columnar cells of the bulb would produce the gustatory organ of the higher mammalia. "This account of the origin of taste-bulbs explains one important difference between them and the other structurally related end-organs, as those of the olfactory region, or sacculi and ampullae; i.e., in the fact that the gustatory cells are massed together in little groups surrounded by protective cells, while the auditory cells in the positions above mentioned, and the olfactory cells, are isolated, each being separately protected by columnar cells. This difference, it appears, is simply due to the latter elongating from a tolerably plane surface, while the gustatory cells have elongated from the curved surface of an interpapillary process, . . . and therefore have met and penetrated the surface in a group."

At the sides of the tongue are long filiform papillae with an axial non-medullated nerve; and over the upper surface are very numerous peculiar papillae, of small size, and surrounded on the summit by a ring of fine, hair-like papillae, generally ten in number; but towards the back of the tongue the hairs disappear on the anterior side, and at last, on the papillae farthest back, there are only two hairs left. The top of the main papilla is concave. The author describes the interesting histology of these organs; but for further details we must refer to the valuable original.—(*Quart. journ. microsc. sc.*, xxiii. 69). C. S. M. [523

The arrangement of the turbinal bones in the fissiped carnivores. — E. D. Cope divides this group of mammals into two tribes, according to the arrangement of the turbinals. The Hypomycteri, including the families Cercoleptidae, Procyonidae, Mustelidae, Aeluridae, Ursidae, and Canidae, have the external nostril occupied by the complex maxilloturbinal bone. The Epimycteri, comprising the remaining families, have the external nostril occupied by the inferior ethmoturbinal and the reduced maxilloturbinal. — (*Proc. Amer. philos. soc.*, xx. 1882, 471.) F. W. T. [524

ANTHROPOLOGY.

The prehistoric antiquity of man. — In his recent work (reviewed in this issue) Mortillet says, "Palaeoethnology is the study of the origin and development of humanity, before the occurrence of historic documents. This science is divided into three parts: 1°. The study of tertiary man, or the origin of humanity; 2°. The study of quaternary man, or the development of humanity; 3°. The study of man in the present epoch, the prolegomena or first horizon of history." The following scheme, of which the work is an elaborate development, will convey some idea of the patience and originality of the author, whatever may be our opinion concerning the durability of his work.

Temps.			Age.	Périodes.	Epoques.
Actuels.		Historiques.	Fer.	Mérovingienne.	Wabenienne, Franque, Burgonde, Germanique.
				Romaine.	Champdolienne. Decadence Romaine.
					Lugdunienne. Beau-temps Romain.
		Protohistoriques.		Galatienne, Étrusque.	Marnienne, Gauloise. 3e Lacustre.
					Hallstattienne, des tumulus. 1re du fer.
	Préhistoriques.		Bronze.	Bohémienne.	Larnaudienne, du marteleur. 2e Lacustre en majeure partie.
					Morgienne, du fondeur. 2e Lacustre partie.
			Pierre.	Néolithique, Pierre polie.	Robenhausienne. 1re Lacustre, des dolmens.
Géologie.	Quaternaire.			Paléolithique, Pierre taillée.	Magdalénienne, des Cavernes, en majeure partie, du Renne presque totalité.
					Solutréenne, du renne partie, du mammouths partie.
					Moustérienne, du grand ours des cavernes.
					Chelléenne, Acheuléenne, du mammouths partie, de l'Elephas antiques.
	Tertiaire.			Eolithique, Pierre étonnée par le feu.	Thenaisienne.

On pp. 28 and 29, the eolithic period is tabulated into upper secondary, eocene, miocene, and pliocene, and further subdivided into thirteen epochs. Part I. (chapters i.–xv., p. 25–125) relates to tertiary man; part II. (chapters i.–xxiii., p. 127–476), to quaternary man; and part III. (chapters i.–xii., p. 479–627), to recent man. One feature of the book will be viewed with favor, that is, the addition of the author's name, in parentheses, to significant discoveries; as, Deposits containing gashed bones of Balaenotus (Capellini), Calaveras skull (Whitney), Delaware gravels (Abbott), etc. — J. W. P. [525

The cerebral convolutions of man. — In 1839 Leuret ascertained that the number and the disposition of the primary convolutions of the brain were constant in different species of mammals. Arrested by disease, on his way to the tomb he confided his work to Gratiolet, who, actuated by the comparative method, extended his researches to the entire series of primates, and succeeded in bringing order out of the chaos of convolutions in the human brain. The labors of these two brilliant investigators were followed up by many as talented as they, — such as Arnold, Bischoff, Ecker, Flower, Huschke, Huxley, Marshall, Meynert, Pansh, Rolando, Rolleston, Turner, Vogt, and Wagner, — but by none with more zeal and care than by Paul Broca of Paris. Even from his tomb he reaches forth his hand to cast one more ray of light upon this obscure subject; for we find, in the January number of the *Revue d'anthropologie*, a paper entitled "Elementary descriptions of the cerebral convolutions of man explained by the brain-chart." Broca was nothing if he was not laborious and painstaking. He had hundreds of brains cast. He examined them all to ascertain the forms that were typical. By means of painted casts and charts he taught his pupils the geography of the brain, as one might teach children the map of Europe. He introduced a system of nomenclature for the hemispheres, the fissures, furrows, lobes, convolutions, and branches, so that the student could follow up his work with a description as accurate as that of the anatomist dissecting a bird. Indeed, this paper is a text-book upon human cranio-cerebral topography. — (*Rev. d'anthrop.*, Jan., 1883.) J. W. P. [526

The skulls of criminals. — Drs. Corré and Roussel have communicated to the French anthropological society the results of their researches upon 202 criminals whose crania are preserved in the museum of anatomy at Brest. They have arrived at the following conclusions: —

1. The skull is remarkable in criminals for a horizontal development, generally above the mean.

2. The sub-brachycephalic, brachycephalic, and mesaticephalic types are much more numerous than the dolichocephalic.

3. The proportion of asymmetry is enormous. It varies little in the different categories, and in the whole criminality it amounts to 65.3 to the 100. It is at its maximum (7.05) among those condemned for immorality and rape; at its mimimum (60), among those condemned for attempts upon life.

4. The deformations of the transverse vertical curve are very remarkable among thieves. Among them, as well as on those condemned for attempted violations of virtue, are to be found a certain number of carinated crania.

5. The deformations of the antero-posterior median curve are common in all the groups: they arise mostly from the flattening of the bregma and of the posterior parietal region.

6. These results confirm and complete those already obtained by several investigators (Broca, Bordier, etc.). — (*Revue d'anthrop.*, Jan. 15, 1883.) O. T. M. [527

EARLY INSTITUTIONS.

Our early economic history. — Professor Meitzen of Berlin reviews von Stein's '*Drei fragen des grundbesitzes*,' and takes occasion to say a great deal that is interesting upon the land-question and the past history of land-holding. One or two points may be noted here. Had we space, we should note other points. The article is significant in many ways. Von Stein makes collective possession and ownership of land the starting-point of our economic development; but Prof. Meitzen says, what is certainly true, that, so far back as the time of Tacitus, private property in land existed everywhere. This property consisted regularly of hides, what the Germans call *hufen*. Attached to these hides were shares or rights in the undivided land,— the *almend*. The hides were divisible in the early time. It was during the feudal period that they came to be indivisible. Without doubt the land was common, open to everybody, during the period of migrations,— the nomad period; but this condition of things did not last long. The land in one place supports only a limited number of animals. A large number cannot graze together. Separate districts were accordingly assigned to separate herds, or several small herds together. These herds would belong to different families. While some of these families grew rich and powerful, others grew poor and weak. The latter were driven from their lands, or reduced to dependence and servitude. Then, as there were dependents and slaves to do the work, agriculture arose. Hides were assigned to the cultivators, which were the property of their respective lords. It is probable that the undivided common land was at this time subject to appropriation. Every man could have, therefore, as many hides as he wanted. It was at a later time, probably, that the common land became subject to communal regulations. This is Prof. Meitzen's theory, as we understand it. It is certainly a great advance on the old theory of primitive equality and communism. Prof. Meitzen says, "Es ist also allgemeine gleichheit der alten Germanen eben so fabel wie allgemeine freiheit." — (*Jahrb. nationalökon. stat.*, Jan. 13.) D. W. R. [528

Land-holding in Damaraland. — C. G. Büttner describes how the land is free to everybody; how the individual appropriates as much of it as he pleases, wherever he pleases, provided he does not, in so doing, trespass upon land already appropriated. There are no boundaries between one man's land and another's; only it is generally considered wrong to enter upon land that has been brought under cultivation by another. The chief wealth of the people consists of flocks and herds, which are driven about from place to place by the owners or the herdsmen. Family life is patriarchal. Slavery exists in a mild form. "Whatever a man puts his hands upon, that is his private property." The writer, or his translator, calls this communism! — (*Pop. sc. monthl.*, March, 1883. From *Ausland.*) D. W. R. [529

Slavery in Europe. — M. Fournier gives us a long article upon the liberation of the slaves in western Europe between the fifth and thirteenth centuries. He considers the parts taken by the church and state respectively in this movement, and concludes that the church was far less instrumental in bringing about the abolition of slavery than has been generally supposed. — (*Rev. hist.*, Jan.-Fév., 1883.) D. W. R. [530

INTELLIGENCE FROM AMERICAN SCIENTIFIC STATIONS.

PUBLIC AND PRIVATE INSTITUTIONS.

New-York agricultural experiment station, Geneva, N.Y.

Variability of maize. — Were the different forms of ear-corn, raised from seed of uniform appearance, shown to one not acquainted with the variability of maize under hybridization, the collection would be referred to many varieties, and perhaps to several species. Even to one who has made a study of the subject, there is a constant series of surprises. As a slight contribution to the subject of the hybridization of corn, I note the following forms as gathered from a small plat planted with fine, uniform-appearing seed of 'podded' corn from an unknown source.

This podded corn is that curious variety wherein each kernel, as well as the whole spike, is surrounded by a husk. It is known under various names; such as, husk corn, Paraguay corn, Texas corn, wild corn, Oregon corn, etc. The variety planted showed a yellow, dent, elongated kernel, each kernel husked, and of a uniformity which suggested an extreme purity or fixity of type.

The crop harvested yielded: 1°. Tassel-corn, — some of the kernels heavily, others slightly husked, and others bearing, in all but size, a most striking resemblance to sorghum-seed, both in shape and structure, and the husk changed to a glume; 2°. Ears with kernels uniformly and lightly husked; 3°. Ears in which the kernel-husk has increased in abundance and length on successive ears, until at last the husk predominates over kernels; 4°. Ears of husked grain, the rows arranged in pairs, the apex of the husk of each of the rows of each pair facing inward; 5°. Some husked ears, but the kernel-husks pure white in some specimens, tinged with red in others; 6°. Fastigiate ears, i.e., a whole mass of ears, each ear occupying the position of a kernel on the cob, and arranged parallel to each other; 7°. Unhusked corn, — red cob, yellowish-white dent kernel, with a sprinkling of sweet-corn kernels through cross-fertilization; 8°. A dark purplish-red ear of unhusked corn, — a dent corn, mingled with some dark-red kernels of sweet-corn.

Variations equally surprising have occurred with us from a fine-appearing white 'pearl' pop-corn used as seed. From the crop, we selected nine ears, any one of which might well be referred to a distinct variety. Some of the ears formed 'rice-corn,' or the kernels mucronate; other ears had the smooth, round, stony grain of the pearl varieties; other ears had taken on the appearance and size of a field flint-corn. The colors varied from white, through the buffs, to yellow, and from light red to dark red, forming, in the nine specimens, nine different colors or shades. The number of rows also differed, and the size and shape of ear.

In habits of growth, some varieties of corn bear the ears on the nodes quite low down, others on the higher nodes; but no variety, so far as numerous observations extend, bears ears on the five upper nodes of the plant. Yet in individual variations a perfectly husked ear is borne on the first node from the tassel; and even four well-husked ears have been found borne grouped around this first node.

While, normally, ears are produced from the axil of

the leaf (i.e., are axillary branches), yet in individual variations a branch may occur in this situation, and one or more ears be borne upon this branch, one ear being terminal.

The tassel may be transformed into groups of ears, the whole character of the tassel being occasionally changed to such an extent that the pistillate flowers replace the staminate. The bearing of a few grains upon the tassel is by no means an unfrequent occurrence. In the case of the tassel bearing many grains, there is a tendency in the upper leaf to curve upward and form a husk, and in cases a fair protection is thus secured.

On the other hand, the terminal portion of the normally situated ear may be extended so as to form a tassel which bears staminate flowers. In rare cases we have a normal appearance of ear for several inches, then a few inches of staminate flowers, and at the end a good ear again; the two perfectly formed ears being connected as if by a section of a tassel-stem, and forming a structure protected by a common husk. Staminate flowers are also occasionally produced on the rachis, along with the normal pistillate flowers; and I have even observed hermaphrodite flowers, — in one case on the cob, and in two cases on the tassel. In cases, also, the ears are branched; the branches starting from the base, or from the middle or terminal portion of the ear. In the tassel we quite frequently find ears crowded together through partial coalescing of the branches, so as to form a corolla, or cup, from which the main stem of the tassel emerges; and, in their normal situation, ears are occasionally so crowded, through branching, as to form a sort of bouquet. The tip of the ear may also divide into many smaller portions, forming the appearance of a tassel-like bunch of cobs terminating the grain-covered portion.

The rows of corn are always even-numbered, but may vary from 8 to 32 in varieties, and, in individual specimens, from 4 to 48. In two ears from the same stalk the number of rows may vary; the length of ear, from 2 to 12 inches in varieties, and in individual variations perfect ears may be found from 1 to 16 inches in length. The kernels are occasionally arranged upon the cob in a spiral. The size of the grain is also subject to great variation. In our collection, normal kernels of a variety called 'miniature' maize weighed one-half a grain, while normal kernels of a variety known as 'Benton dent' weighed 12 grains.

The shape of the grain is very varied. It may be longer than broad, or broader than long, varying from oval to shoe-peg form in flat and spherical variations; the upper surface rounded, or flattened, or pointed, or dented. The dent may be a central depression, as a notch, or a crease, or irregular. A cross-section is in some varieties square, in others rectangular, in others round, in others oval, in still others irregular. The structure may be all farinaceous, as in the Tuscarora; or semi-transparent and hardened, as in sweet-corns; or hard and horny, as in the pop-corns; or partly farinaceous and partly corneous, as in the common flints and dents. The chit also varies in length in the varieties, and in the form of the depression in which it lies; and the pedicle of the grain may appear strongly marked, as in the 'pod-corn.'

In germination, occasionally twin-embryos are formed, and in one case we have noted three. The roots may emerge from the base of, or may crowd off, the caulicle, and appear from the under side, or, in cases, may emerge from the caulicle at apparently any point. From the first node they almost invariably emerge. We thus seem to have a double system of roots, — the tap-root, emerging from the base; and the fibrous roots, which emerge from the sides of the caulicle. In exceptional cases the tap-root seems suppressed and the fibrous roots of the monocotyledon appear in its stead.

After the corn-kernel has germinated, it may be thoroughly dried, and will then start anew when planted. The plumule retains its life while new roots are formed, or exceptionally the descending axis retains its life, and renews its growth. This we have repeated to the fifth germination, with intervals of one week's drying between germinations. In one instance of variation a twin-embryo sent up two cotyledons, one of which afterwards developed into a leaf. This was the only case among many hundreds of observations.

E. LEWIS STURTEVANT, *Director.*

March 13, 1883.

University of Cincinnati.

Laboratory notes. — Several investigations, conducted under the direction of Prof. F. W. Clarke, are far enough along to warrant preliminary notices.

The phosphides of platinum have been prepared by O. T. Joslin. When phosphorus is thrown upon white-hot platinum, fusion takes place, and a brittle, silver-white button of Pt_3P_5 is obtained. This, treated with hot aqua regia for at least forty hours, only partly dissolves. The soluble portion agrees sharply with the formula Pt_2P_4, and PtP remains absolutely insoluble. By long roasting in a muffle, the original Pt_3P_5 is reduced to Pt_2P. The Pt_2P_4 is probably identical with the phosphide described by Schrötter as PtP_2.

The tartrates of antimony are being studied by Mr. C. S. Evans, and one set of results is complete. When alcohol is added to a solution of Sb_2O_3 in aqueous tartaric acid, a white precipitate is formed, concerning which earlier experimenters differ. We now find, that at least three distinct compounds may be thus produced, as follows: when there is a large excess of tartaric acid, the neutral salt $Sb_2(C_4H_4O_6)_3 . 6H_2O$ is thrown down. With a slight excess of acid, $Sb_2(C_4H_4O_6)_2 O . 6 H_2O$ is produced. The third compound should be $Sb_2(C_4H_4O_6)O_2$, and is said to have been described by Berzelius. We have obtained a compound approximating to this formula, but it was not absolutely pure. All three salts may be regarded as derived from Sb_2O_3 by successive replacements of one, two, and three atoms of oxygen by $C_4H_4O_6$.

The specific gravity of cadmium iodide is given, on Bödeker's authority, as 4.576. Mr. E. A. Kebler, assisted by Mr. E. Twitchell, has prepared the compound in a variety of ways; and we find that two distinct modifications exist. The normal CdI_2 has a specific gravity of 5.6 to 5.7, and is very stable: the other ranges from 4.6 to 4.7, is deliquescent, and decidedly unstable. The conditions governing the formation of the latter have yet to be made out. The normal salt represents union of cadmium and iodine without change of volume.

NOTES AND NEWS.

— The lecture season at the Lowell institute in Boston is drawing to a close. So far back as most of us can remember, the institute has annually tempted some distinguished scientific Englishman or other European to lecture to Boston audiences, and has done, perhaps, as much as any other establishment in the country to elevate the scientific standard. This year an unusual variety has been offered, and the au-

diences have been large and attentive. The courses were opened toward the end of October with six lectures by Dr. William B. Carpenter of London, on the Physical geography of the deep sea, in which he treated successively of the oceanic basin generally, thermal significance of oceanic water, action of prevalent winds on the ocean-surface producing horizontal circulation, physical conditions of inland seas, animal life of the deep sea, and land and sea in geological time. This was followed by a second course of six lectures by the same on Human automatism. The question was stated in the first lecture, and was followed by a discussion of congenital or primary automatism, secondary or acquired automatism, automatism in intellectual action, of the motive powers, and in morals.

On alternate evenings during the progress of these courses, Dr. George L. Goodale of Harvard university gave twelve lectures on Physiological and geographical botany: an outline sketch of some of the relations of plants to their surroundings. These series were followed by a course of six lectures on Motion and matter, by Professor Thomas C. Mendenhall of the Ohio state university, beginning Dec. 4; by twelve lectures on the Philippine Islands, with sketches of Panama, Japan, China, Singapore, Ceylon, the Red Sea, and the Mediterranean volcanoes, by Dr. Samuel Kneeland of New York, on Dec. 12 and following days. Three lectures on Storms were given by Mr. W. M. Davis of Harvard university, beginning Jan. 8; two on the Jelly-fishes, by Dr. J. Walter Fewkes of the Museum of comparative zoölogy, on Jan. 22 and 25. On Jan. 23, Professor Samuel P. Langley of the Allegheny observatory began a series of twelve lectures on the Sun and stars. Professor James T. Bixby of the Meadville theological school is about finishing a course of twelve lectures on the Inductive philosophy of religion; and Mr. F. W. Putnam of the Peabody museum began, March 13, his current course of six lectures — the last, we believe, for the season — on American archeology. The topics of the several lectures in this last course are, 1°. Ancient mounds, earthworks, and fortifications in the United States; 2°. Explorations of ancient towns; 3°. Stone graves of the Cumberland valley, and their contents; 4°. Ancient pottery; 5°. Altar-mounds and their contents; 6°. Burial customs, and the arts of the ancient Peruvians.

— The meeting of the International commission on the geological map of Europe was held at Foix last September. The commission consists of two committees, — one on the map, and one on nomenclature. The former is composed of Messrs. Beyrich and Hanchecorne (directors having but one vote), Daubrée, Giordano, De Moeller, Mojsisovics, and Topley. At the last meeting, Messrs. Daubrée, Mojsisovics, and Topley were absent. The Austrian and German geologists have agreed to form only one commission for the execution of the geological work of central Europe. A scale of the sedimentary formations, adopted by Austrian and German geologists, was accepted as a provisional basis for discussion. The commission voted unanimously to adopt the proposition of Mr. Neumayer to appoint a committee to compile a paleontological nomenclator. Much difficulty, however, seems to have arisen in coming to a general understanding about this nomenclature. The length of time required for the publication of the map will probably exceed the limit of six years. Some of the geographical sheets are already engraved, and a number of others are drawn. Assent to the subscriptions demanded had not yet been received from France, Spain, Scandinavia, Germany, and Denmark. The last meeting of the commission previous to the Berlin congress of 1884 will be held at Zurich, probably in August. The general price of the map will be 125 francs to the public, 100 francs to the subscribing governments.

— The Smithsonian institution, in co-operation with the Biological society of Washington, is making an effort to procure full statistics with regard to the trees, shrubs, and herbaceous plants growing in the public grounds of the city and suburbs. In order to trace the changes which have taken place in tree-planting in this district, it is desirable to learn what kinds were grown here soon after the permanent establishment of the government in Washington in 1800, and where specimens of these can now be examined. Information is wished for as to any rare or remarkable trees known to have stood in the public grounds, but removed during the extension of public buildings or other improvements, or of trees of great size or age, or remarkable for their connection with public events.

— Dr. J. C. Houzeau, director of the Royal observatory at Brussels, has returned to Belgium from his expedition to the United States to observe the transit of Venus, and, having obtained leave from his government, will spend the remainder of the winter season at Cannes. The king of Belgium is anxious to have the observatory transferred to Lacken, to an eligible site in the vicinity of his castle; but as yet the removal is not definitely decided upon. A temporary shed has been erected for the new meridian-circle made by the Repsolds.

— According to *Nature*, March 8, the mathematical papers and memoirs of the late Professor Henry J. S. Smith of Oxford are to be collected and published in two quarto volumes by the press of his own university. Miss Smith will contribute a biological introduction; and the general editorship of the work, which will include a considerable quantity of hitherto unpublished material, will be intrusted to Mr. J. W. L. Glaisher.

— Eugene G. Blackford issues a most attractive invitation to witness the 'display' of brook-trout he will make at his stalls in Fulton Market, New York,

April 2, at the 'opening of the trout-season, 1883,' when "examples of fish-culture from all the leading fish-culturists and fish-commissioners of the United States will be displayed." The folded card of invitation is printed in colors by Armstrong & Co. of Boston, and represents a trout-brook and fishing-paraphernalia on one page, while the opposite reproduces an admirable sketch of swimming trout by Beard. The whole is done in admirable taste.

— The fifth annual meeting of the Sanitary council of the Mississippi valley will be held at Jackson, Miss., April 3. Dr. John H. Rauch, secretary of the Illinois state board of health, is secretary of the executive committee.

— The finished portion of the new chemical laboratory for Phillips academy, Andover, Mass., was first occupied by the class in analytical chemistry March 5. For want of funds, only the east wing has as yet been built. The estimated cost of the whole is $20,000.

— A despatch from London, dated March 21, states that an eruption of Etna has occurred, accompanied by an earthquake, overthrowing several houses, and causing a panic in the vicinity. A despatch from Catania, two days later, reports eleven fissures in the mountain, and the central opening as active, but adds that there is no discharge of lava. Rome telegrams of the 25th, however, state that the eruption is unimportant and apparently subsiding.

— We are glad to aid in calling attention to the Association for the preservation of the scenery of Niagara Falls, formed in New York with the support of Messrs. G. W. Curtis, H. Potter, Ch. Lanier, J. H. Robb, and many others, for the purpose of securing state assistance in rescuing the neighborhood of the falls from unsightly surroundings. Through the efforts of this association, a bill has just passed the New-York Assembly, authorizing the appointment of commissioners to survey the lands about Niagara, and report to the next legislature. The bill has still to pass the senate, and receive the governor's approval. Membership in the association may be obtained by a subscription of ten dollars; and smaller contributions will be acceptable, as a considerable expense is incurred in keeping the matter before the public. The secretary is Rev. J. B. Harrison, P.O. box 105, New York; treasurer, Ch. Lanier, Esq., corner Nassau and Cedar Streets, New York. Dr. V. Y. Bowditch, 113 Boylston Street, Boston, will forward subscriptions from New England.

— The treasurer of the Balfour memorial fund acknowledges the following subscriptions: Joseph LeConte, University of California, $5; J. G. Scott, principal State normal school, Westfield, Mass., $5; Samuel Garman, Harvard University, $3; Walter Faxon, Harvard University, $5; A. H. Tuttle, State University, Columbus, O., $20; previously acknowledged, $385.

— Two correspondents of the *Scientific American*, March 17, give accounts of curious snowballs formed by the wind blowing over the surface of loose snow. The snow was formed into cylinders, with conical cavities at each end, nearly meeting in the centre, resembling rolls of cotton-batting. The fields are described as covered with rolls from the size of an egg up to twenty inches in diameter and forty in length.

— It is proposed to close the gap at the Delaware Breakwater with a concrete superstructure, resting upon a granite rip-rap foundation. This is necessitated by the deterioration of the harbor from a marked decrease in depth. At the meeting of the Philadelphia engineers' club, Feb. 17, Mr. J. M. Stewart described the plans for the improvement.

— Professor Thomas H. Huxley of London was elected a foreign honorary member of the American academy of arts and sciences at its last meeting, March 14, in place of the late Professor Bischoff; and Dr. Johann F. J. Schmidt of Athens, in the place of the late Professor Plantamour.

— John Burroughs writes charmingly and truthfully of 'Signs and seasons,' in the March *Century*.

— At the meeting of the Appalachian mountain club, March 14, Prof. E. C. Pickering read a paper on mountain observatories, and Mr. A. E. Scott one on the exploration of the Twin Mountain range.

— The forty-third regular meeting of the Biological society of Washington was held March 16. Mr. Orville A. Derby communicated some biological notes from Brazil. Mr. William T. Hornaday spoke on the mental capacity of the elephant, and Mr. Newton P. Scudder on the length of the hatching-period of the domestic fowl. Specimens illustrating giant clams of the Pacific were exhibited by Lieut. Francis Winslow, U.S.N.; accidents to animals, by Mr. F. A. Lucas; sections of hermaphroditic oysters, by Mr. J. A. Ryder; fossil ship-worms, by Dr. C. A. White; and microscopic sections of supposed coal, by Mr. George P. Merrill.

— At the meeting of the Boston society of natural history, March 21, Prof. S. P. Sharples gave an account of a visit to Turk's Island, and Mr. S. Garman made some remarks on fossil horses.

— The Field naturalists' club of Ottawa held their fifth *soirée* on Friday, March 16. Mr. W. P. Lett read a paper on the ducks resorting to the neighboring waters, and gave most interesting and valuable descriptions of their habits and food, — the result of many years' experience as a sportsman and observer of nature. Mounted specimens of the various ducks were exhibited. Dr. Small read the report of the botanical branch of the club on the work of the preceding season. It showed that twenty-five species of plants had been added to the lists already published, and gave many interesting facts concerning the occurrence of these and other rare species. Several exquisite paintings of rare plants were made for the

occasion by Mrs. Chamberlin. Mr. W. H. Harrington read the report of the entomological branch, indicating the work so far accomplished in the study of the Ottawa fauna, and the amount that would still be required to develop a knowledge of the various orders. The report referred to some rare species, and to others which had been unusually abundant or destructive. A case specially prepared showed many of the insects mentioned, with labels giving scientific and common names, and food-plants. Some discussion followed the lecture and reports; and a vote of thanks was tendered to the lecturer for his valuable paper.

— The electrical exhibition at Caen, France, will open May 15. The board in charge consists of Count du Moncel, honorary president; MM. Boreux, Boutard, Lecornu, Rabut, Professor Neyreneuf, M. Berjot, *père*, MM. Baumier and Veriene. Any applications for space should be addressed to the mayor of Caen, who is also a member of the board.

— A paper on Our coal interests, read by P. W. Sheafer at the annual meeting of the Mining institute of Pennsylvania, held at Shenandoah, Jan. 27, has been printed in full in the Mining herald of that place for Feb. 24.

— The *Scientific American supplement* for March 17 contains a long article by L. P. Gratacap, on the American museum of natural history in Central Park, New York.

— The second report on the Peter Redpath museum of McGill university, just issued, contains several papers by Principal Dawson, noticing important donations, and describing new and interesting specimens: one on a whale from the Saxicava gravel, near Smith's Falls, Ontario, 420 feet above the St. Lawrence; another on miscellaneous carboniferous fossils from the eastern provinces; and a third on graptolites of the Quebec group.

— Telegrams to the daily press announce that the scientific expedition sent out by the United-States government, under the charge of Prof. Edward S. Holden, to observe the coming eclipse of the sun at the Caroline Islands, reached Lima, Peru, in good health, and had just sailed thence in the U. S. sloop-of-war Hartford for their destination.

— Dr. Paul Topinard took occasion, at one of his last spring's course of lectures at the school of anthropology in Paris, to sum up the labors of Count George Louis LeClerc Buffon [1707–1788] as a student of the natural history of man, considering him "as the chief of the new school which produced Étienne Geoffroy Saint-Hilaire, and the precursor of Lamarck and Darwin." — "He was not only the precursor of Lamarck, but his inspirer."

— In our Summary, paragraph 372, for 'Rurichnites,' read 'Rusichnites,' and for 'Traena,' 'Fraena.'

RECENT BOOKS AND PAMPHLETS.

Adrews, L. W. I. Zur kenntniss einiger isomeren bromnitrobenzolsulfonsäuren. II. Ueber triphenylborat. Bonn, 1882. 45 p. 8°.

Barner, F. Krystallographische untersuchung einiger organischen verbindungen. Göttingen, 1882. 45 p., pl. 8°.

Bellardi, L. I molluschi dei terreni terziarii del Piemonte e della Liguria. III. Gasteropoda. Torino, *Loescher*, 1883. 253 p., 12 pl. 4°.

Bethke, A. Ueber die bastarde der veilchen-arten: inaug.-diss. Königsberg, *Beyer*, 1882. 20 p. 4°.

Beyda, H. F. T. Mathematische beschäftigungen aus früheren jahren. i., ii. heft. Stuttgart, *Metzler*, 1883. 48 p. 8°.

Boedeker, H. I. Ueber benzylanalin und phenylbenzylhydrazin. II. Diazobenzolcinid und jodaethyl: inaug.-diss. Göttingen, 1882. 36 p. 8°.

Brauer, F. Offenes schreiben als antwort auf Hrn. Baron Osten-Sackens 'critical review' menier arbeit über die notacanthen. Wien, *Hölder*, 1883. 11 p. 8°.

Caldarera, F. Introduzione allo studio della geometria superiore. Vol. i. Palermo, *Lauriel*, 1882. 626 p., 8 pl. 8°.

Charencey, H. de. Mélanges de philologie et de paléographie américaines. Paris, *Leroux*, 1883. 195 p. 8°.

Clevenger, S. V. Art institute lecture on artistic anatomy and the sciences useful to the artist. Chicago, *Newell, pr.*, 1883. 20 p. 8°.

Corrente, G. Sulla fillossera. Caltanissetta, 1882. 10 p. 4°.

Doormann, C. Anwendung der Lamé'schen functionen auf probleme der potentialtheorie bezüglich der dreiaxigen ellipsoids und der Fresnel'schen elasticitätsflache: inaug.-diss. Leipzig, 1882. 74 p. 8°.

Ebert, T. Die tertiären ablagerungen der umgegend von Cassel: inaug.-diss. Göttingen, 1882. 28 p. 8°.

Garbini, A. Apparecchio della digestione nel Palaemontes varians. Verona, *tip. Franchini*, 1882. 89 p., 3 pl. 8°.

Kraetzschmar, L. Ueber die verbreitung der lecithin im pflanzenreich: inaug.-diss. Göttingen, 1882. 30 p. 8°.

Landsberg, Max. Ueber imide zweibasischer säuren: inaug.-diss. Königsberg, *Beyer*, 1882. 58 p. 8°.

Loe, A. Ueber den glycerinäther: inaug.-diss. Göttingen, 1882. 37 p. 8°.

Luerssen, Chr. Die pflanzen der Pharmacopoea germanica botanisch erläutert. i lief. Leipzig, *Haessel*, 1883. 64 p., illustr. 8°. [To contain 6–7 lief.]

Manzoni, A. La struttura microscopica delle spugne silicee del miocene medio delle provincie di Bologna e Modena. Bologna, *Treves*, 1882. 24 p., 7 pl. 4°.

Mari, G. La storia naturale nelle sue applicazione, con riguardo speciale ai prodotti italiani. Milano, *Rivolta*, 1883. 11+904 p. 8°.

Matthews, F. E. I. Verbindungen der blausäure mit den halogenwasserstoffsäuren. II. Condensation einiger aldehyde mit acetessigäther, etc.: inaug.-diss. Bonn, 1882. 42 p. 8°.

Merrick, C. S. Ueber die einwirkung von jodallyl auf anhydrobenzolyldiamidobenzol: inaug.-diss. Göttingen, 1882. 34 p. 8°.

New York — State survey. Report for the year 1881. James T. Gardiner, director. Albany, *Weed, Parsons, & Co., pr.*, 1882. 81 p., 1 pl. 8°. 5 maps.

Olleck, H. von. Analytische untersuchungen über das verhalten von phosphaten zu citronensäure-lösungen: inaug.-diss. Göttingen, 1882. 29 p. 8°.

Oschatz, F. Experimentalle untersuchungen über die physiologische wirkung der chinolins: inaug.-diss. Göttingen, 1882. 50 p. 8°.

Pieper, R. Ueber einige metamere hydroxylaminderivate: inaug.-diss. Königsberg, *Beyer*, 1882. 38 p. 8°.

Schirmacher, E. Die diluvialen wirbelthierreste der provinzen Ost.- und Westpreussen: inaug.-diss. Königsberg, *Bayer*, 1882. 52. p., 5 pl. 8°.

Schutzkwer, Nachum. Das coffein und seine verhaltung im thierkörper: inaug.-diss. Königsberg, *Bayer*, 1882. 25 p. 8°.

Steffen, M. Die landwirthschaft bei den altamerikanischen kulturvölkern. Leipzig, 1883. 139 p. 8°.

Wandtafeln (Vier) zur erklärung der elektrodynamischen maschinen. München, *Buchholz*, 1883. imp. f°. Mit text, 10 p. 8°.

Wiesinger, F. Ueber die einwirkung von eisenchlorid auf orthophenylendiamin: inaug.-diss. Göttingen, 1882. 31 p. 8°.